Lean

Past – Present – Future

A SCM perspective

Joure, June 30th 2009

Jaap-Willem Bijsterbosch
Managing Director
TruEconomy Consulting

Lean

What is it…


WENGER

Thought # 1:

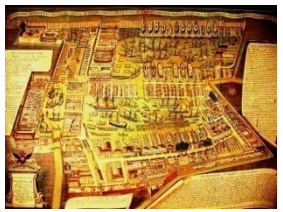
the objective determines what is lean and what is not

Lean

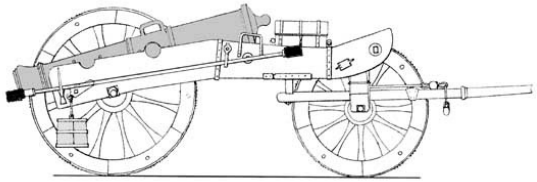
The past….

Lean is Old & not Japanese

- The **Venetians** understood “flow” production by 1400 – making one ship a day (so probably did the Chinese!)

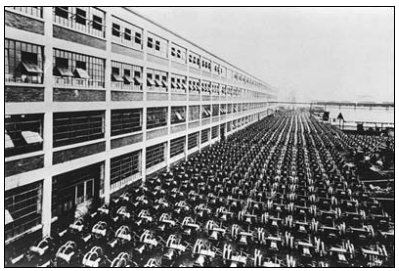


- The French Army understood the need for interchangeable parts before 1789



- Blanchard made rifles on automatically cycling machines laid out in cells in Springfield in1818

- **Ford** developed the first complete **“flow production”** system at Highland Park, Detroit in 1914

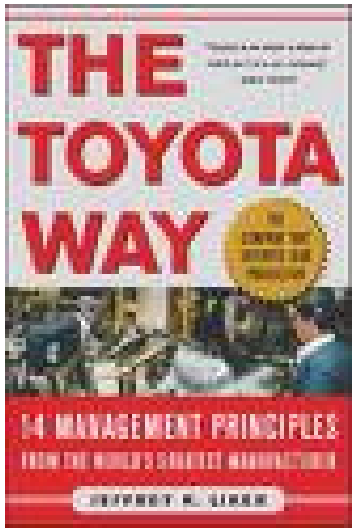


From Mass to Lean

- **Ford** went on to create **"mass production"** at the Rouge in 1927 - making huge volumes of parts for assembly globally – using big machines, big batches, and complex coordination as pull became push

- **Toyota** extended "flow production" to cope with variety – using simple machines with quick change tools, in process sequence pulled by customer demand

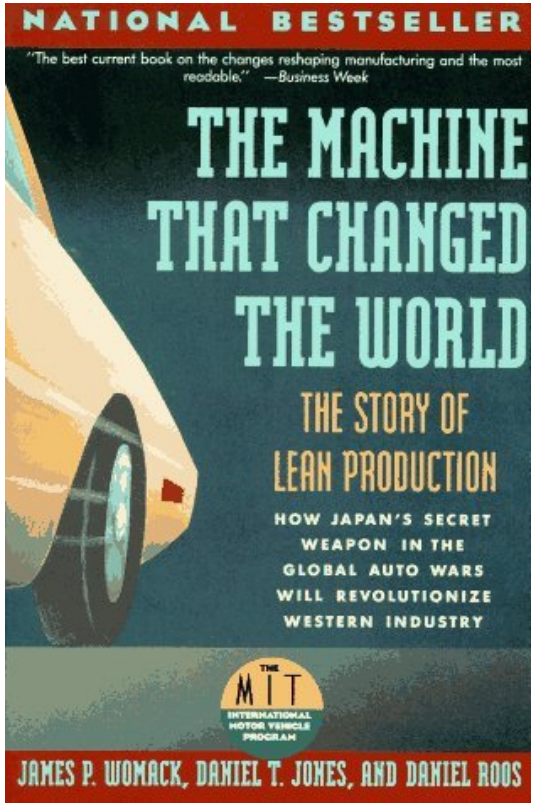
- **TPS** or **"Lean production"** was perfected by 1970 and extended across the whole enterprise and across the whole of Toyota City – as the **"Toyota Way"**

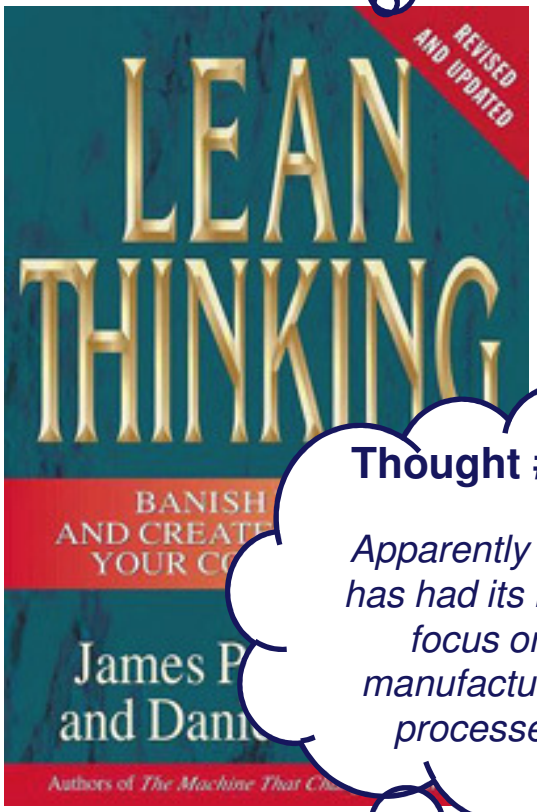


MIT research 198

Thought # 1:

the objective determines what is lean and what is not





Thought # 2:

Apparently lean has had its main focus on manufacturing processes

Lean

… the present….

Toyota - the Lean Model

- Most people now recognise that Toyota is **setting the pace** – based on its Lean business system
  - It leads in efficiency and quality around the world
  - It also leads in time to market for new products
  - And in introducing new technologies - like hybrids
  - It is globalising assembly and localising parts supply
  - It has overtaken Ford and (no surprise) GM!
- Superficially Toyota's **functional organisation** looks familiar!
- So what distinguishes the way it operates?

Toyota's Lean Strategy

"Brilliant process management is our strategy.

We get brilliant results from average people managing brilliant processes.

We observe that our competitors often get average (or worse) results from brilliant people managing broken processes."

Lean Thinking is Process Thinking

The Dynamics of Lean

No created demand amplification

Separate capacity planning from production instructions

Combine steps where you can to flow

Levelled and released in small quantities

Demand signals direct from the customer's point of use

Reflexive Pull all the way back to raw materials

Production pulled from every upstream step

To only one pacemaker process

FIFO

Uninterrupted flow back to the customer's point of use

Every Product Every Interval capability

Every step is:- Valuable Capable Available Flexible and Adequate

With just the right Standard Inventory of:- Cycle stock Buffer stock and Safety stock

No warehouses, only Cross-Docks and Mixed-model Milk Runs

Lean Thinking

Thought # 1:

the objective determines what is lean and what is not

- The objective is to manage the business ba wards from the consumer definition of **value** - not forwards from your **organisation** and your **assets**
- To create **lean primary processes** to design, deliver and support this value - with minimum wasted effort and time – and the necessary **lean support processes**
- And to build a **lean m t system** to sustain and impr ses ov
- Be clear about , be the **Processes** ng the

Observation # 1:

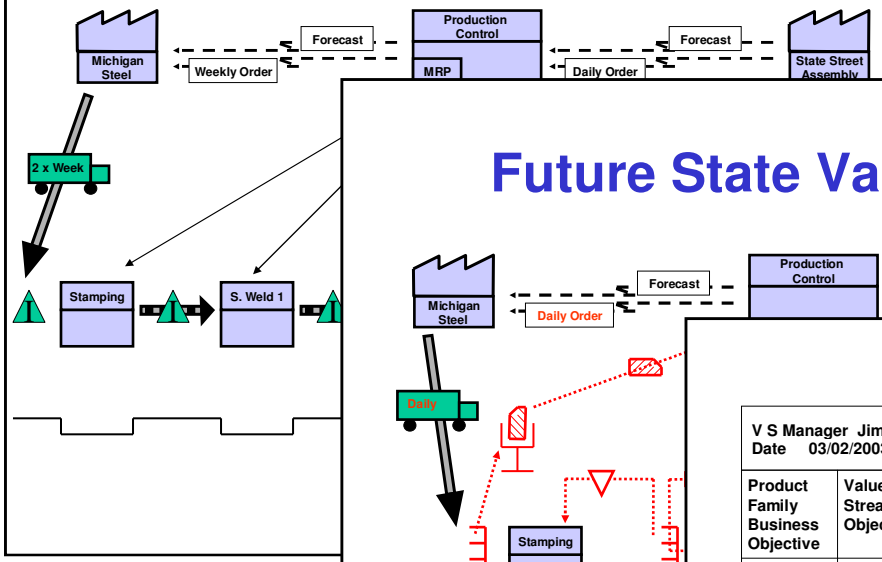
8 times the word "process" in the last 2 slides

Thought # 2:

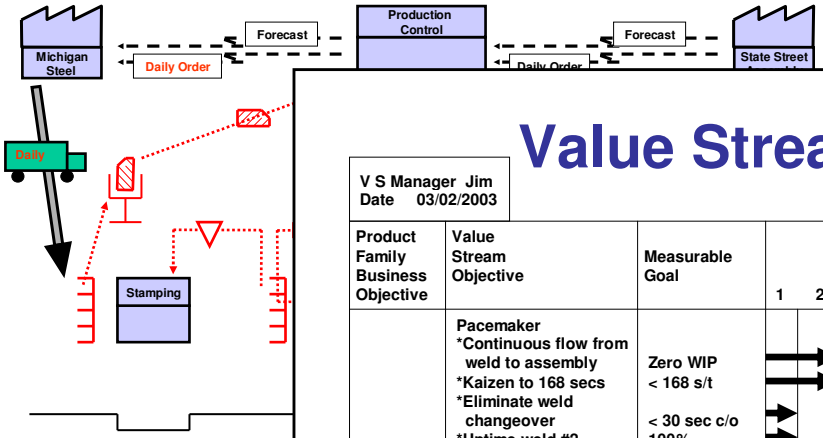
Apparently lean has had its main focus on manufacturing processes

Implementing Lean

Current State Value Stream



Future State Value Stream



Value Stream Plan

V S Manager Jim
Date 03/02/2003

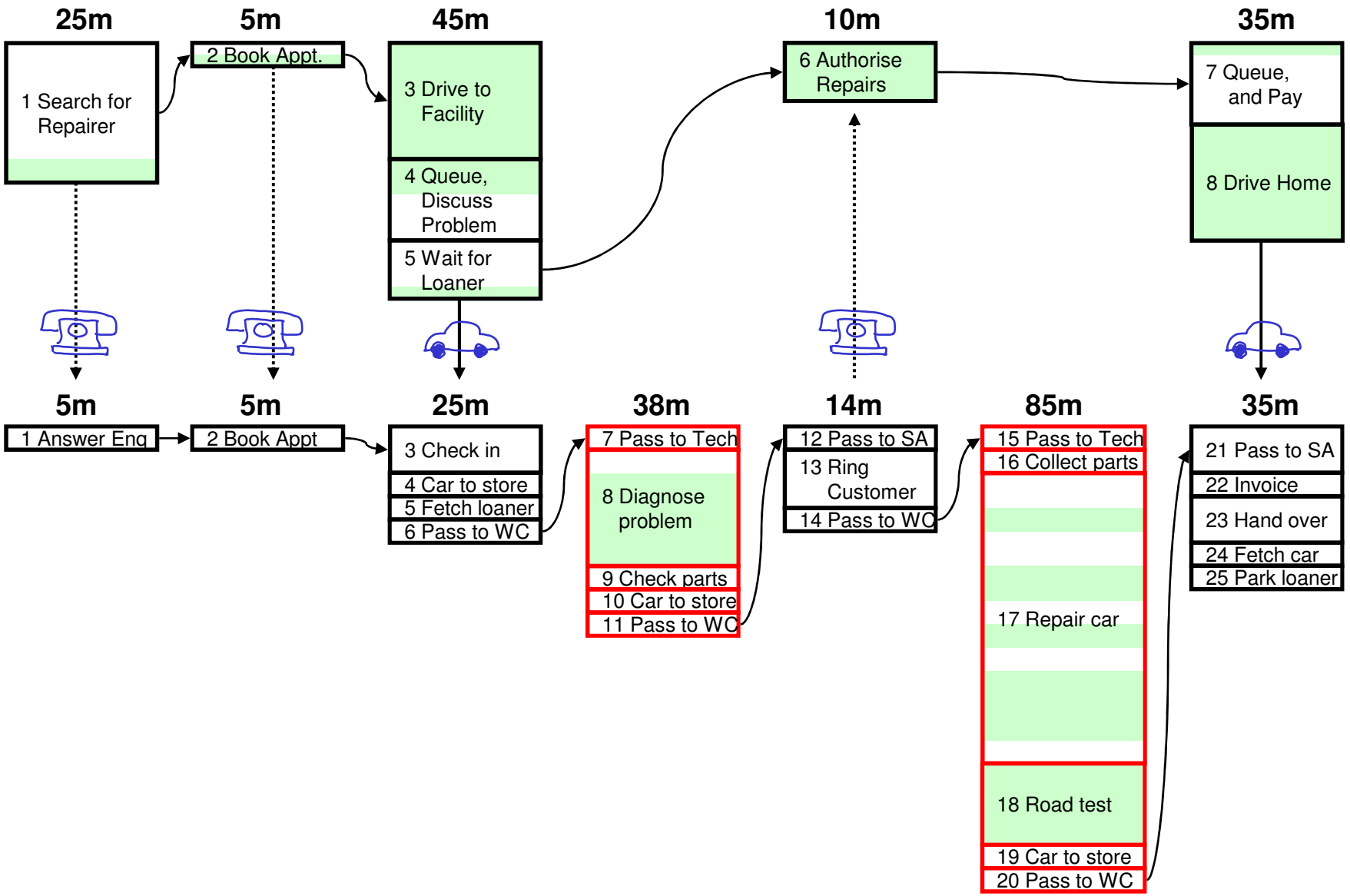
Product Family Steering Brackets

Product Family Business Objective	Value Stream Objective	Measurable Goal	Monthly Schedule 1 2 3 4 5 6 7 8 9	Person in Charge
Improve Profitability In Steering Brackets	Pacemaker *Continuous flow from weld to assembly *Kaizen to 168 secs *Eliminate weld changeover *Uptime weld #2 *Finished goods pull *Materials handler routes	Zero WIP < 168 s/t < 30 sec c/o 100% 2 days FG Pull Schedule		John Dave Sam Mike Sue James
	Stamping *Stamping Pull *Stamping changeover	1 day inventory + pull schedule batch size 300/160 pieces c/o < 10 min		Fred Tim
	Supplier *Pull coils with daily deliveryr	daily delivery < 1.5 days of coils at press		Graham

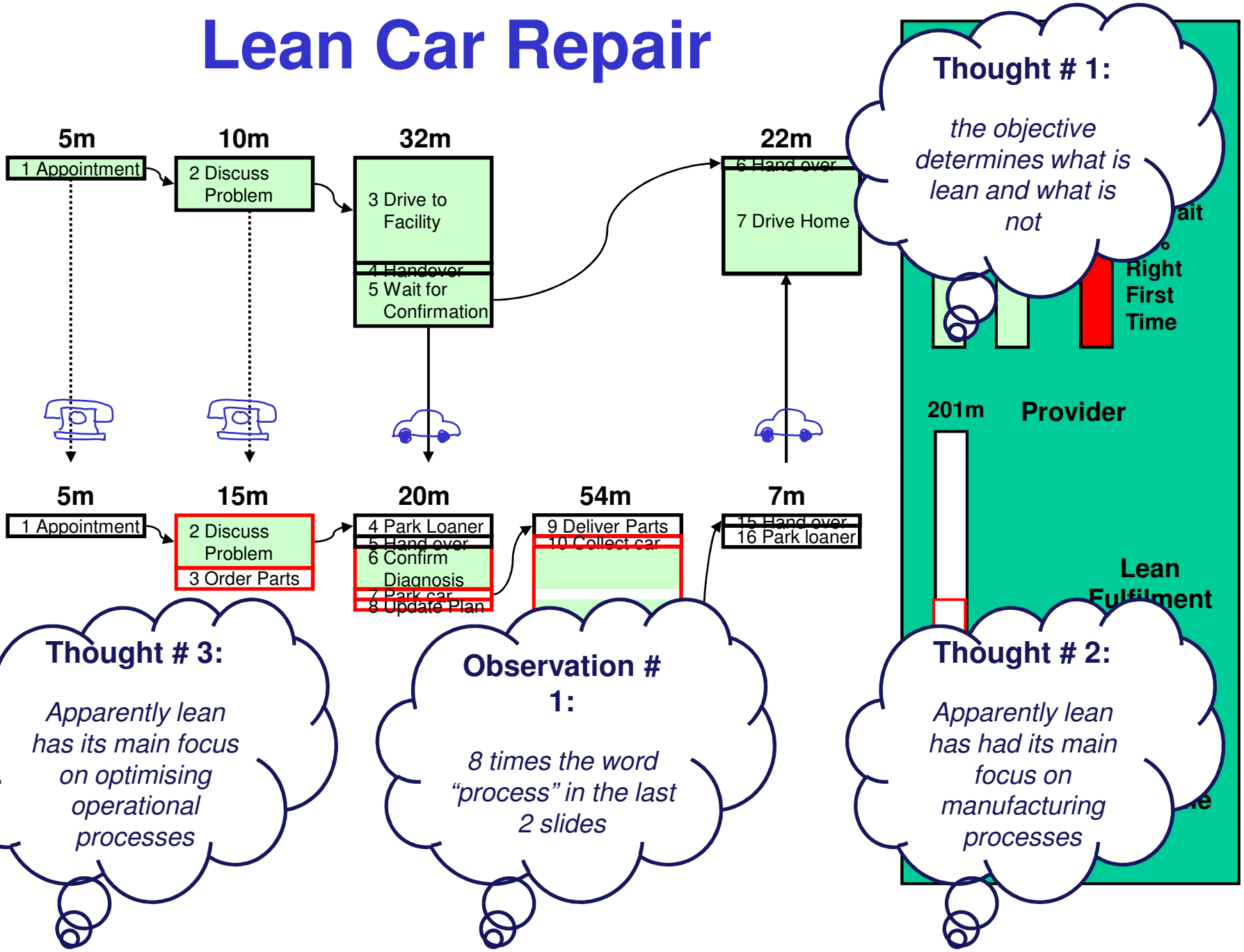
Check progress and stabilise

Ask the key questions

Car Repair Before Lean



Lean Car Repair



Lean

… the future

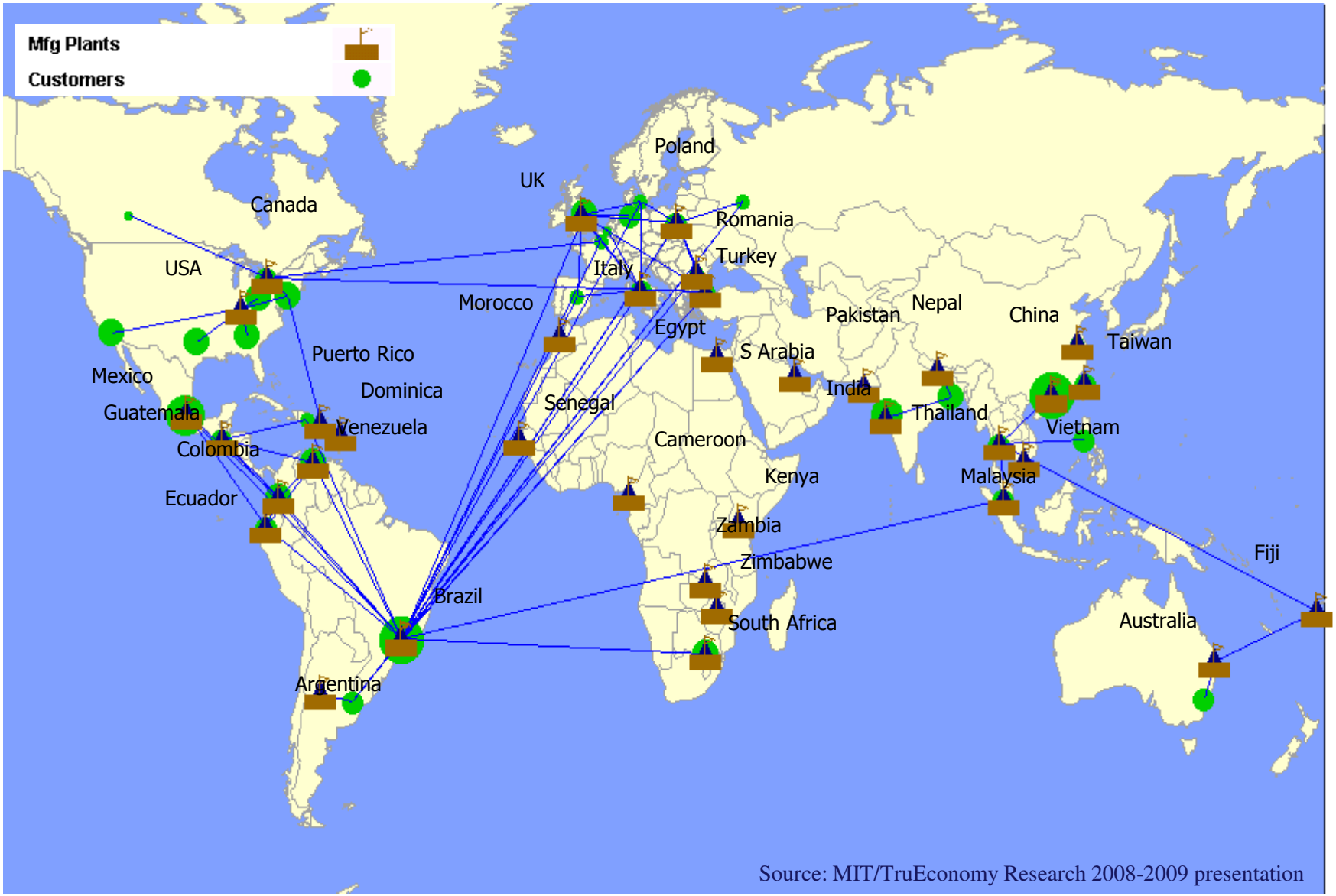
Thought # 3

Apparently lean has its main focus on optimising operational processes

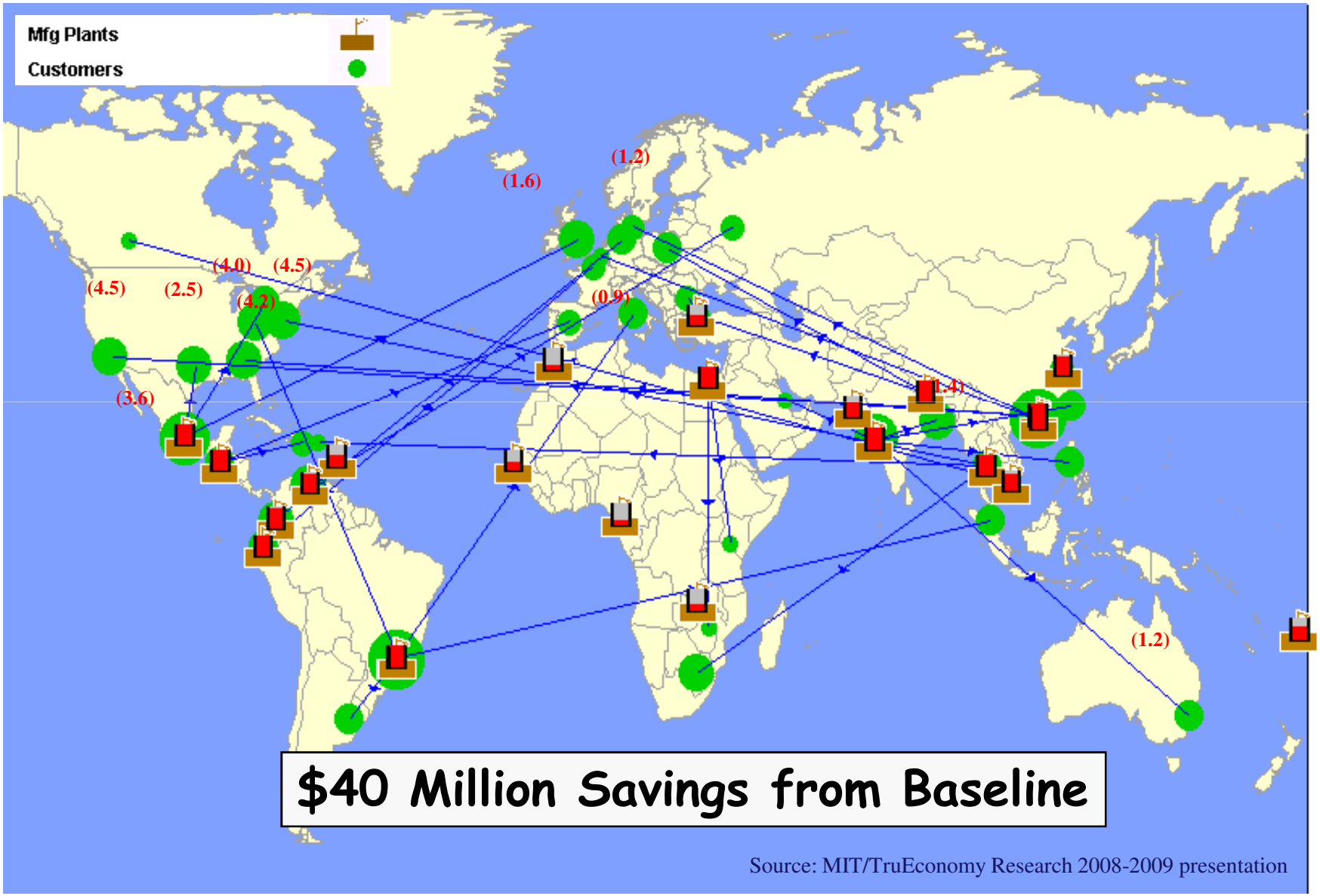
Thought # 4

Lean has the same potential, if not bigger, to optimise the Supply Chain if the tactical and strategical perspective is taken

Sample Global CPG Lean Plant Location Study



Optimized Situation - The lean network



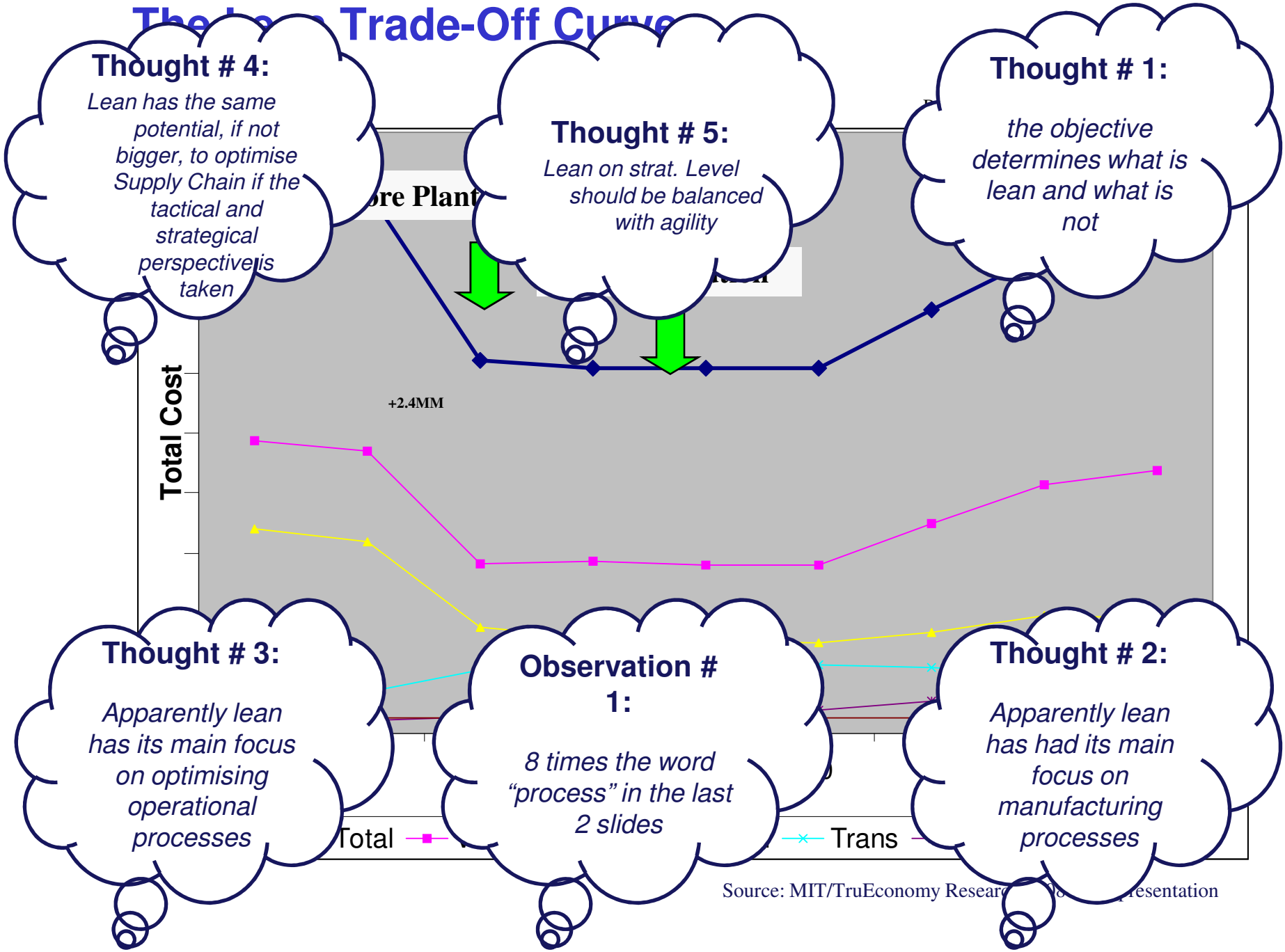
Source: MIT/TruEconomy Research 2008-2009 presentation

Impact of Strategical Lean Supply Chain Design

- Significant reduction in waste (total cost), but….
- …. Higher risk
  - Utilization of manufacturing facilities in Asia and Latin America is maximized; any disruption of supply will make it impossible to satisfy many market areas
  - No manufacturing facilities in North America and Europe; long and variable supply lead times long

Source: MIT/TruEconomy Research 2008-2009 presentation

The Lean Trade-Off Curve

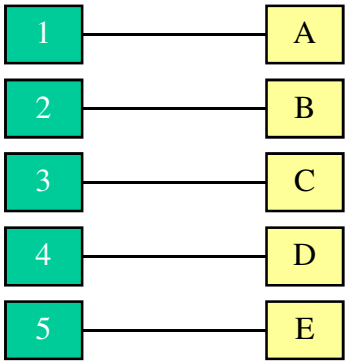


Source: MIT/TruEconomy Research

Complementary concepts in strategical Lean thinking

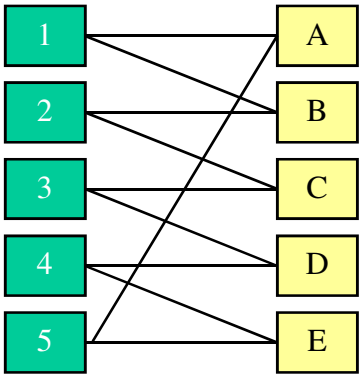
Strategic Lean vs. Flexibility

Very Lean



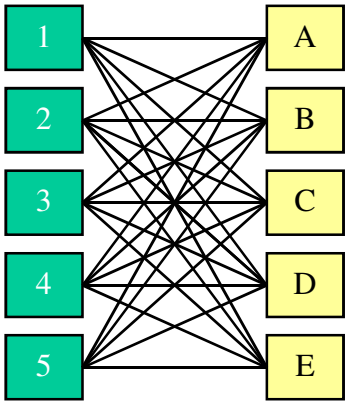
No Flexibility

Lean -



2 Flexibility

Lean ---



Total Flexibility

Source: DSL flexibility presentation

Sample 2: Flexibility and the Lean Manufacturing Network

- Manufacturer in the Food & Beverage industry.
- Currently each product family is manufactured in one of five domestic plants.
- Manufacturing capacity is in place to target 90% line efficiency for projected demand.
- Objectives:
  - Determine the cost impact of manufacturing flexibility to the network.
  - Determine the benefit that flexibility provides if demand differs from forecast;
  - Determine the appropriate level of flexibility

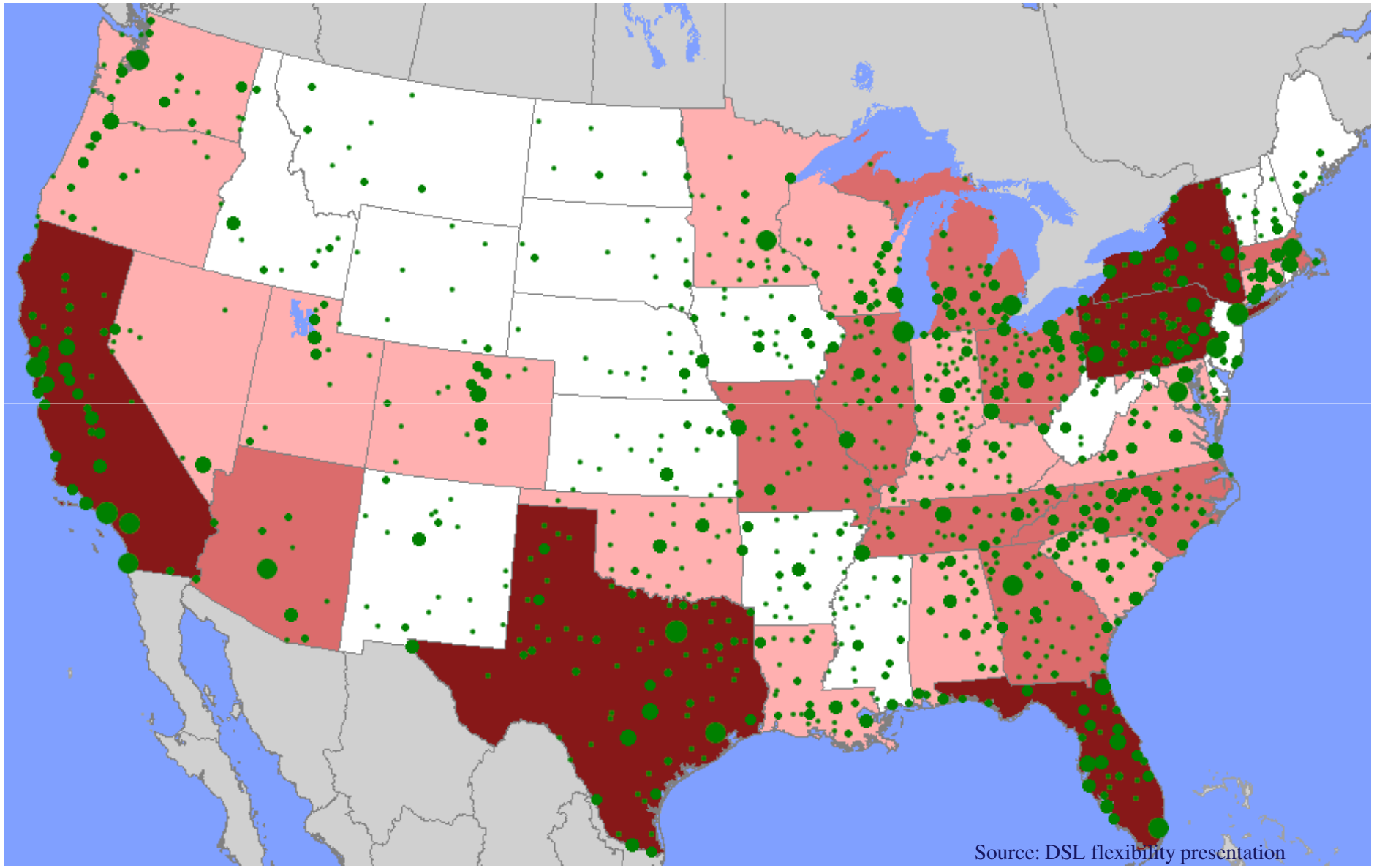
Source: DSL flexibility presentation

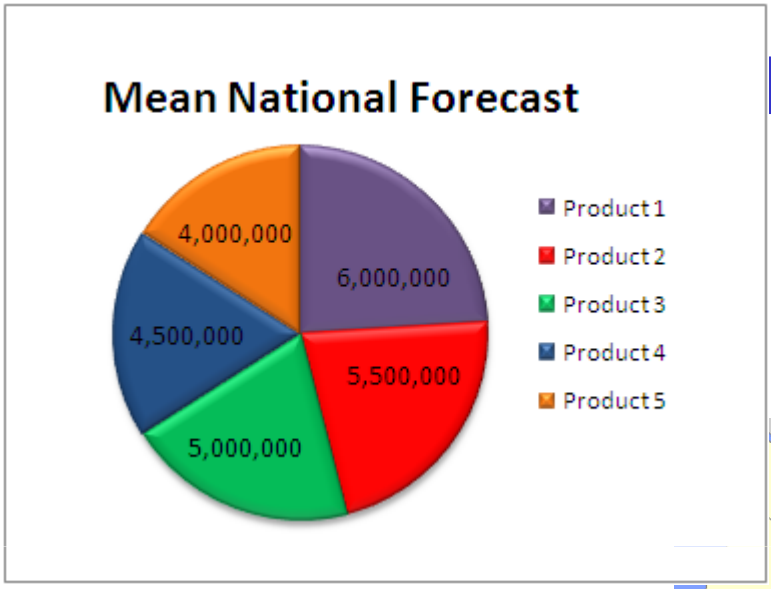
Summary of Network

- Manufacturing is possible five locations with the following average labor cost:
  - Pittsburgh, PA $12.33/hr
  - Dayton, OH $10.64/hr
  - Amarillo, TX $10.80/hr
  - Omaha, NE $12.41/hr
  - Modesto, CA $16.27/hr
- 8 DC locations: Baltimore, Chattanooga, Chicago, Dallas, Des Moines, Los Angeles, Sacramento, Tampa
- Customers aggregated to 363 Metropolitan Statistical Areas & 576 Micropolitan Statistical Areas
  - Consumer product- Demand is very closely proportional to population
- Transportation
  - Inbound transportation Full TL
  - Outbound transportation LTL and Private Fleet

Source: DSL flexibility presentation

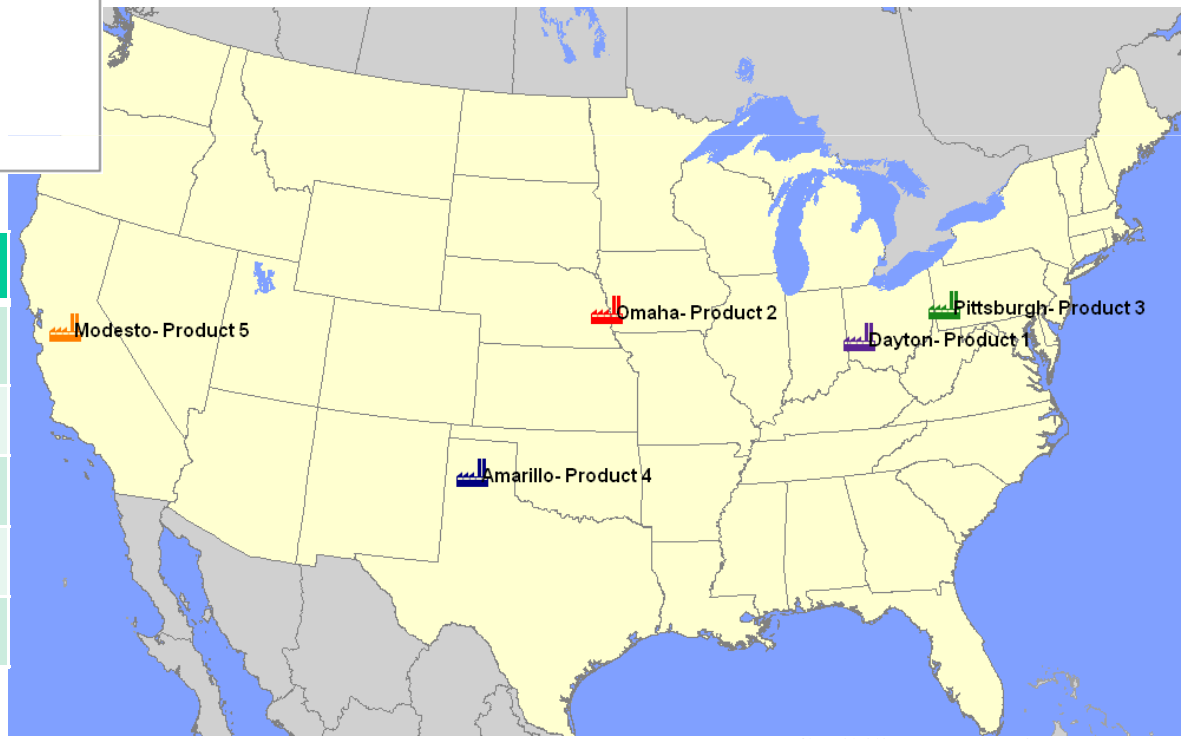
Network Visualization- Customer Demand





Cost Description	Baseline
Production Cost	34,960,649
Plant to Whse Shipping Cost	20,264,858
Whse to Cust Shipping Cost	11,751,467
Warehouse Fixed Costs	8,400,000
TOTAL COST	75,376,974

Plant	Labor Rate
Pittsburgh, PA	$12.33/hr
Dayton, OH	$10.64/hr
Amarillo, TX	$10.80/hr
Omaha, NE	$12.41/hr
Modesto, CA	$16.27/hr



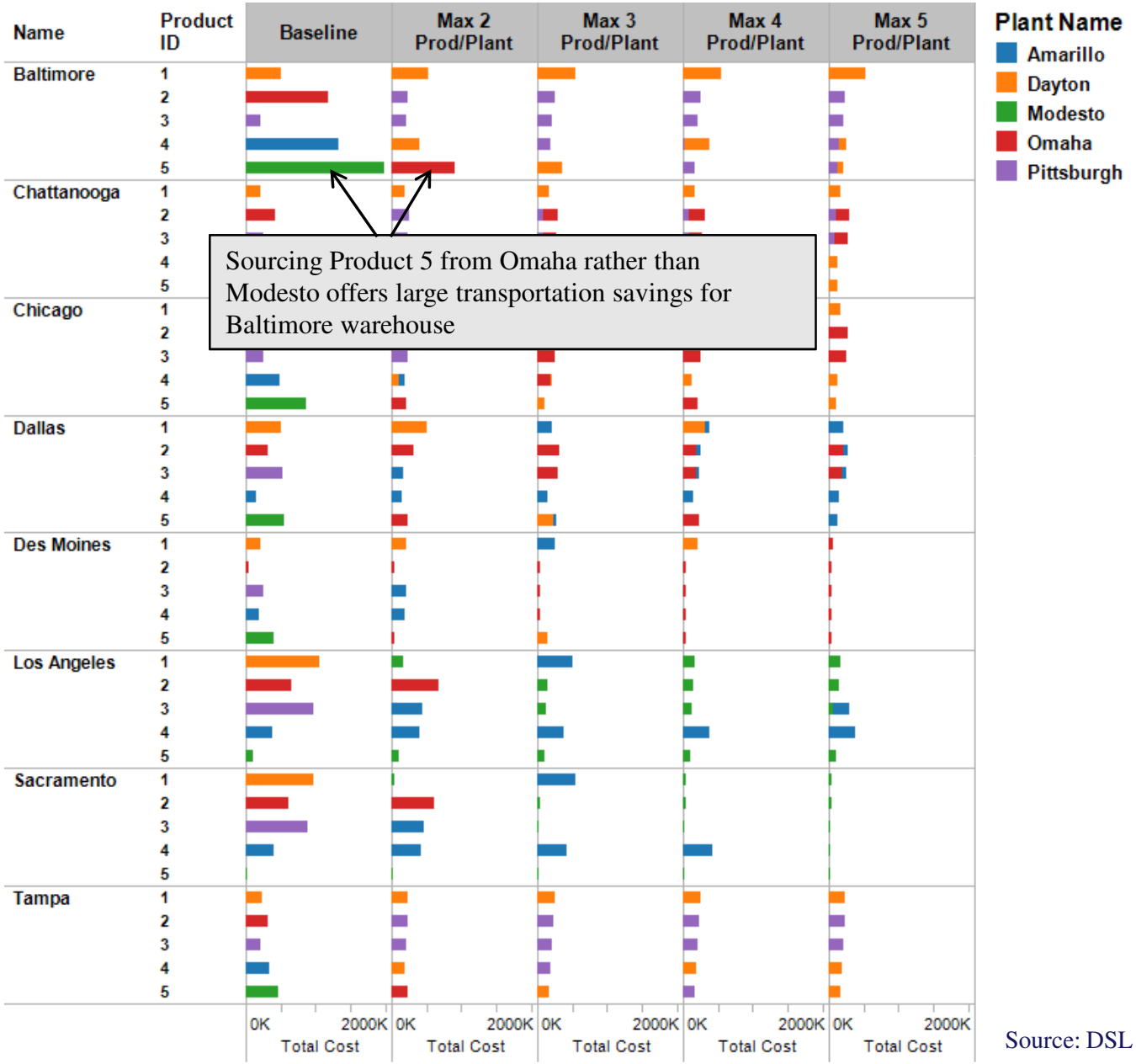
Source: DSL flexibility presentation

Introducing Manufacturing Flexibility

- To analyze the benefits of adding manufacturing flexibility to the network, the following scenarios were analyzed:
    1. Base Case: Each plant focuses on a single product family
    2. Minimal Flexibility: Each plant can manufacture up to two product families
    3. Average Flexibility: Each plant can manufacture up to three product families
    4. Advanced Flexibility: Each plant can manufacture up to four product families
    5. Full Flexibility: Each plant can manufacture all five product families

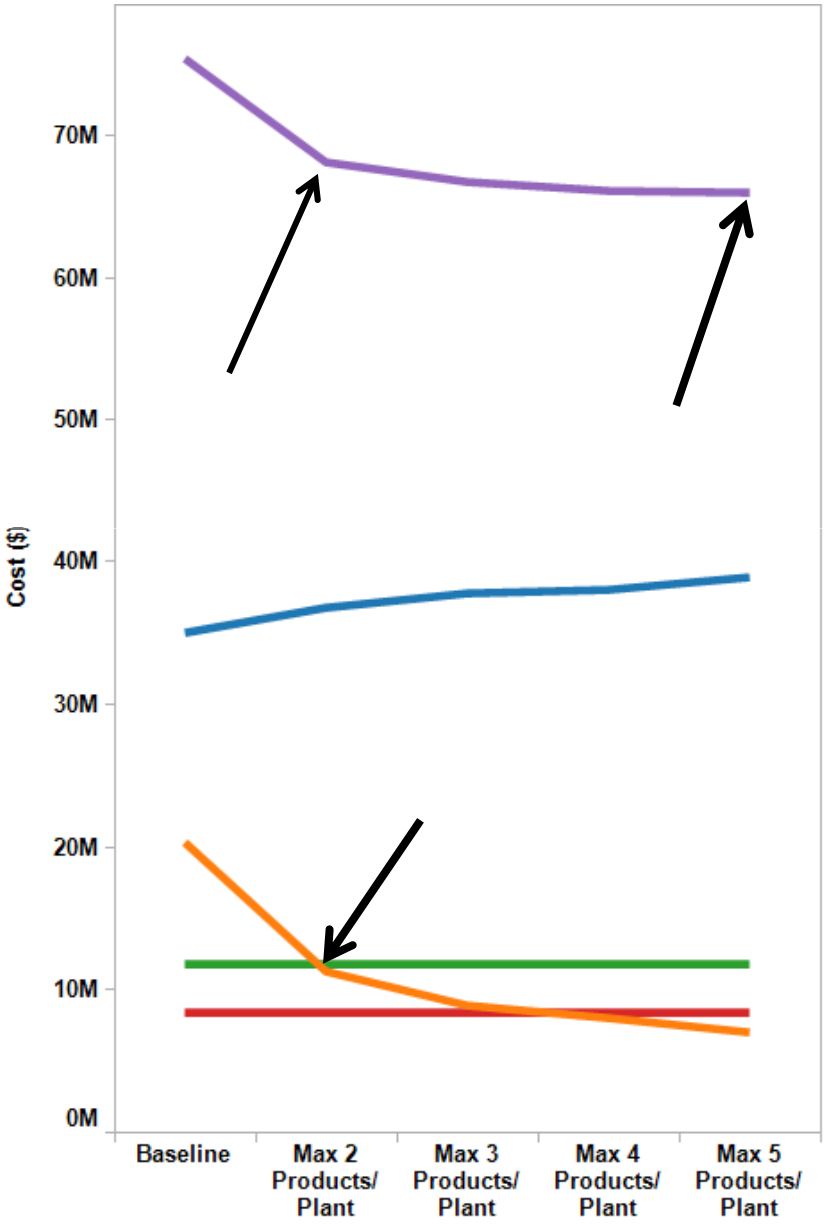
Source: DSL flexibility presentation

Plant to Warehouse Shipping Comparison



Source: DSL flexibility presentation

Total Cost Comparison

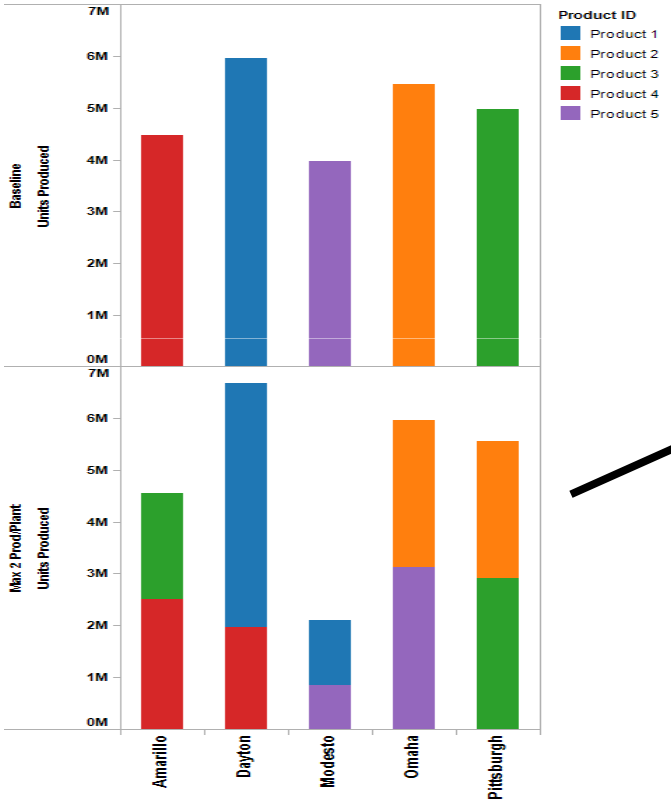


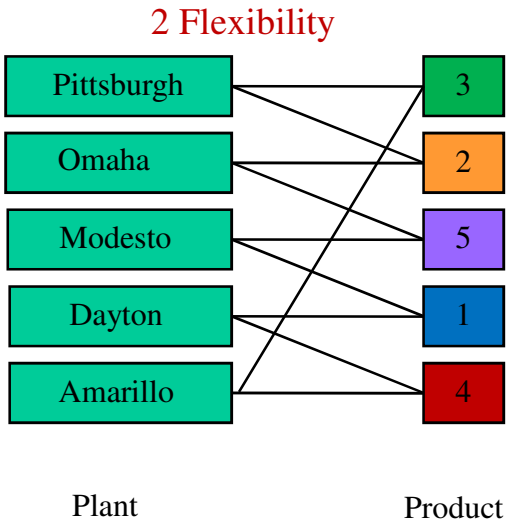
Cost Description	Baseline	Max 2 Products/ Plant	Max 3 Products/ Plant	Max 4 Products/ Plant	Max 5 Products/ Plant
Production Cost	34,960,649	36,730,087	37,639,959	37,913,955	38,830,279
Plant to Whse Shipping Cost	20,264,858	11,225,563	8,895,809	8,006,541	6,908,562
Whse to Cust Shipping Cost	11,751,467	11,692,662	11,722,858	11,743,225	11,773,756
Warehouse Fixed Costs	8,400,000	8,400,000	8,400,000	8,400,000	8,400,000
TOTAL COST	75,376,974	68,048,313	66,658,625	66,063,721	65,912,597

- The maximum variable cost savings with full flexibility is 13%
- 80% of the benefits of full flexibility is captured by adding minimal flexibility
- Significant reduction in transportation cost

Source: DSL flexibility presentation

Why 2-Flexibility is so powerful?





- 2 Flexibility provides the benefits of full flexibility through the creation of a chain

Source: DSL flexibility presentation

Alternatives to 2 Flexibility

Thought # 4:

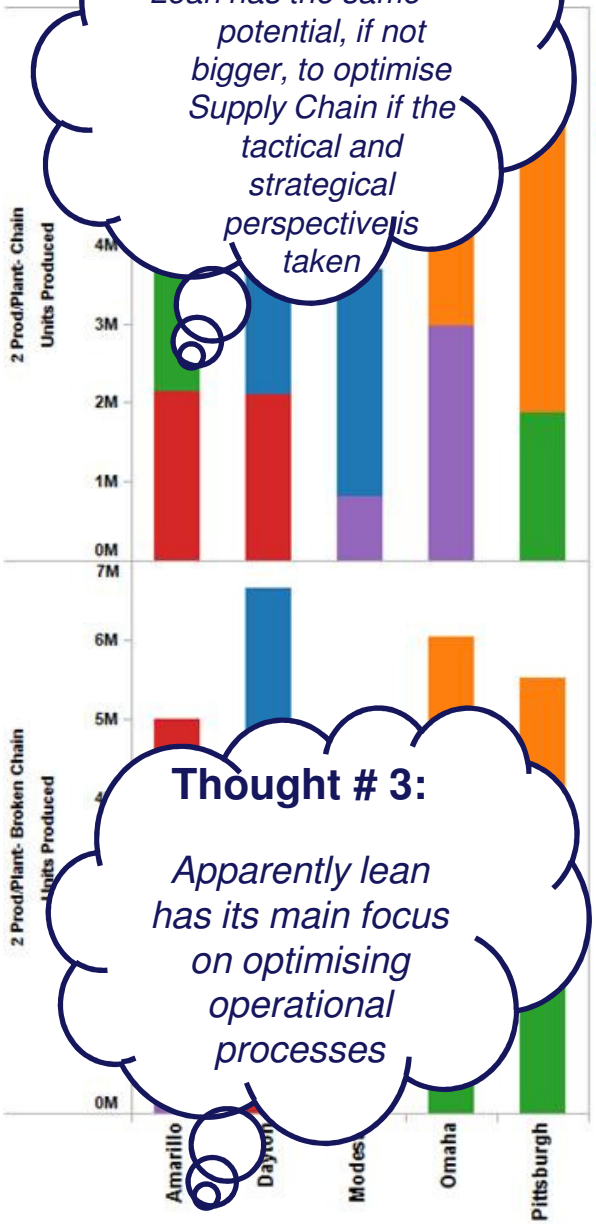
Lean has the same potential, if not bigger, to optimise Supply Chain if the tactical and strategical perspective is taken

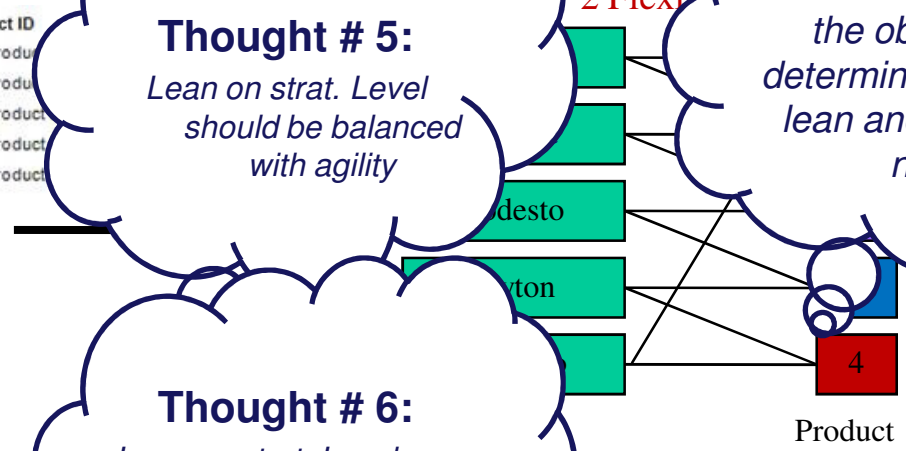
Thought # 5:

Lean on strat. Level should be balanced with agility

Thought # 1:

the objective determines what is lean and what is not

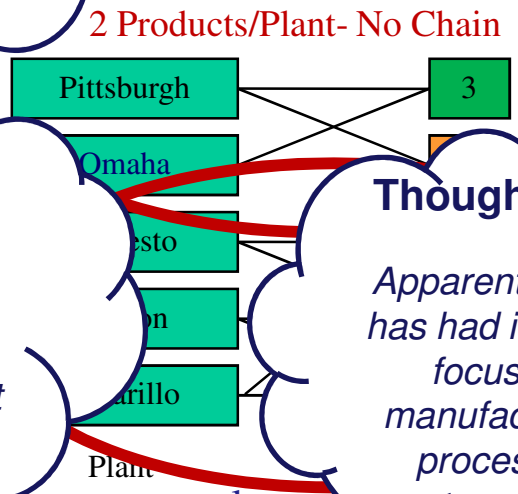




Thought # 6:

Lean on strat. Level can be equally balanced with flexibility

des the benefits of full flexibility
n of a chain



Thought # 3:

Apparently lean has its main focus on optimising operational processes

Observation # 1:

8 times the word "process" in the last 2 slides

Thought # 2:

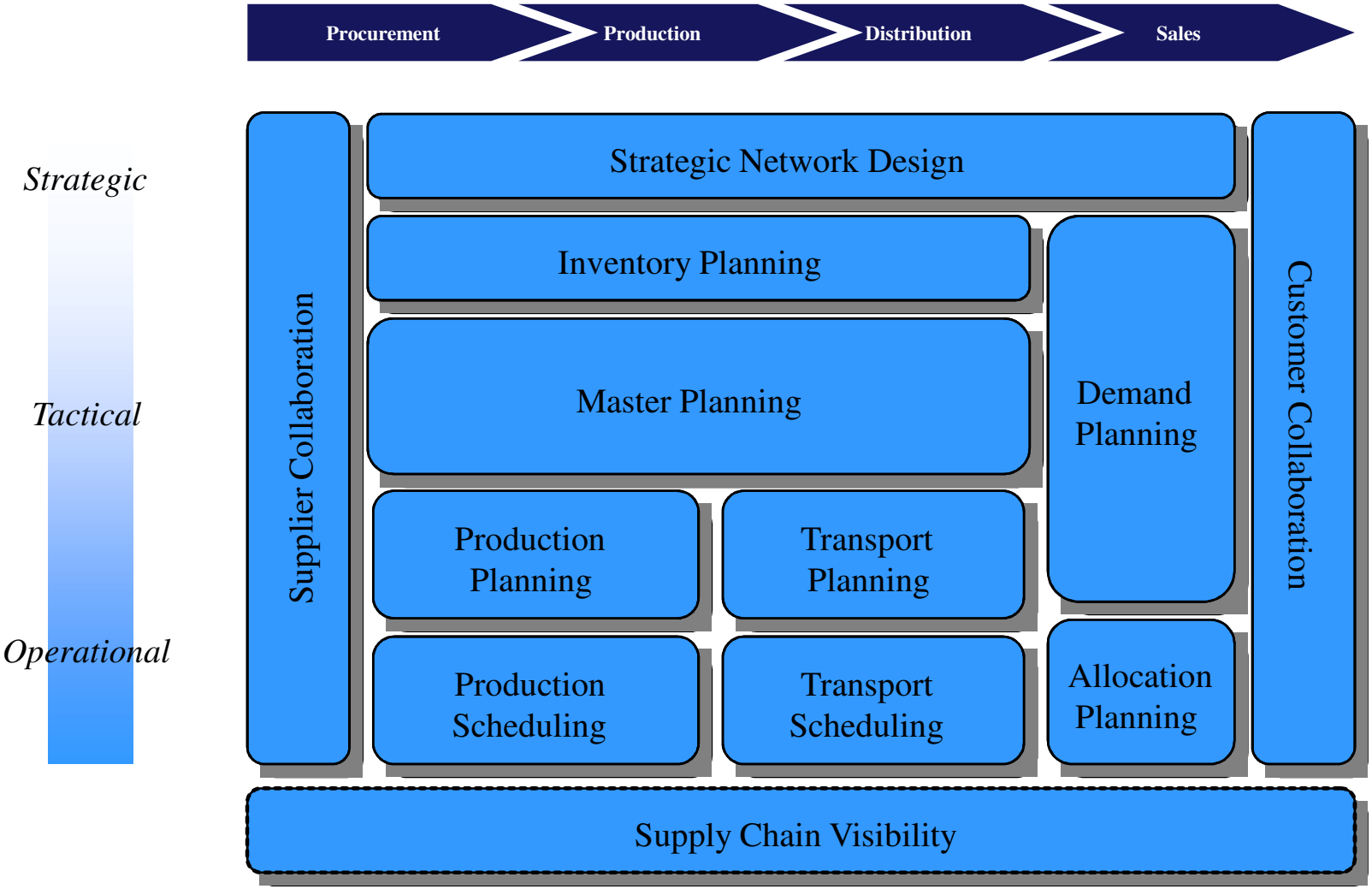
Apparently lean has had its main focus on manufacturing processes

gh the same total numb ons are made,
breaking the chain reduces flexibi considerably

Lean is one of the multiple SC excellence means…

- SC Excellence through:
  - **Product design**
    - Modular product architecture, Standardization, Postponement, Substitution
  - **Process design**
    - Flexible work force, Lean, Organization & Management structure, Flexible contracts, Dual sourcing, Outsourcing
  - **System design**
    - Capacity redundancy, Manufacturing strategy, Distribution strategy

…and should be applied beyond manufacturing



FROM
LEAN PRODUCTION
PROCESSES

TO
LEAN SC NETWORKS