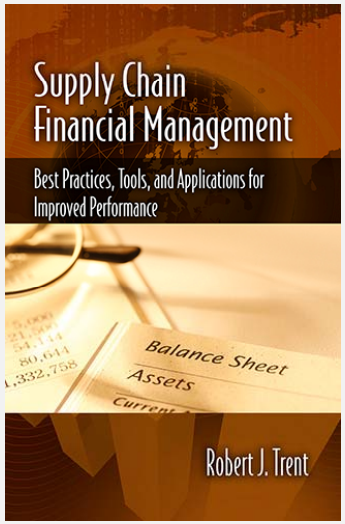
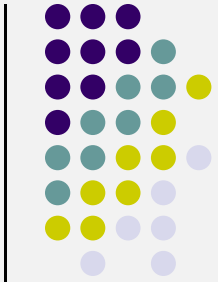


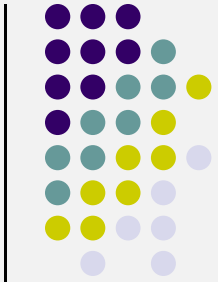
By Robert J. Trent, Ph.D.

End-to-End Lean Management



Creating a Lean Supply Chain Modules

- **Part I: Lean Overview**
- Part II: Lean Supply
- Part III: Lean Transportation
- Part IV: Lean Operations
- Part V: Lean Distribution
- Part VI: Lean Measurement and Tools

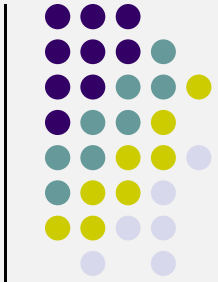


Elements of a Lean Supply Chain

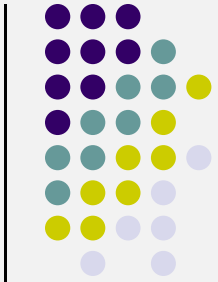
- Lean purchasing/supply
- Lean transportation
- Inventory pull systems/visible signals
- Facility layout changes/work cells
- Set up reductions
- Level build schedules
- Uniform loading
- Total quality and continuous improvement
- Standardized material handling/containers

Major Elements of Lean Operations

Elements of a Lean Supply Chain



- Product and process simplification
- Total preventive maintenance
- Flexible workforce
- Teamwork
- Right performance measures



"By definition, to be exceptional you have to be the exception, not the rule."

Dharmesh Shah, Co-founder of HubSpot's

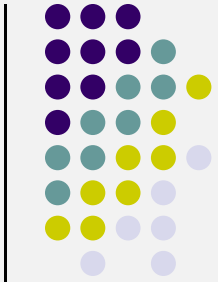
What eight lessons can we learn from racing teams and their pit stops? The importance of…..

What is the major lean innovation here?

http://www.boeing.com/Features/2010/05/bca_moving_line_05_24_10.html

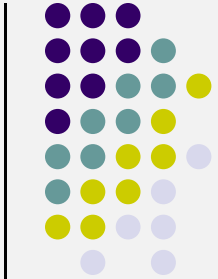
What costs and benefits are associated with a returnable container system?

What is one of the most important factors in an emergency surgery supply chain?

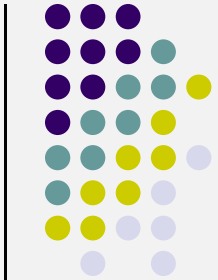


What does end-to-end lean management mean?

Different Perspectives on Lean



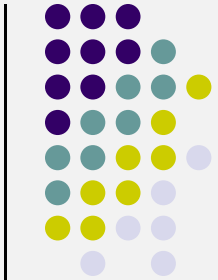
Lean Thinking James Womack and Daniel Jones	Lean thinking seeks to eliminate waste, specify value, line up value-creating actions in the best sequence, conduct those activities without interruption whenever someone requests them, and perform them more and more effectively
Lean John Shook	A philosophy that seeks to shorten the time between the customer order and the shipment to the customer by eliminating waste
Lean Manufacturing www.isixsigma.com dictionary	Initiatives focused on eliminating all waste in manufacturing processes
Lean John Kerr	Lean is essentially a business discipline that is built around obeying only the customer's demand signals and getting rid of waste everywhere in the supply chain
Lean Lean Advisors, Inc.	Lean is simply a thought process, not a tool, used to look at your business, whether it is manufacturing, service, or any other activity where you have a supplier and a customer/receiver. The thought processes within Lean are identifying waste from the customer perspective and then determining how to eliminate it
Lean National Institute of Standards and Technology	A systematic approach to identifying and eliminating waste through continuous improvement, flowing the product at the pull of the customer in pursuit of perfection
Lean Anonymous	Lean is a set of tools to reduce waste, where waste is defined as any non-value added process for which the customer is not willing to pay



We need to understand…

- Wasteful activities
- Non-value added activities
- Value-added activities

What is our objective with each type of activity?



Waste: Anything other than the minimum amount of equipment, materials, parts, space, and worker's time which are absolutely essential to add value to the product.
~Shoichiroo Toyoda, Toyota President

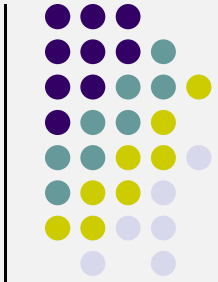
Is this too narrow of a lean perspective?

The Traditional Wastes…

Defects	Increasing the cost of non-conformance through quality errors
Excess Inventory	Maintaining excess inventory due to over buying, over production, or poor inventory management
Excessive Processing	Performing more tasks or steps than what a process requires
Unnecessary Motion	Any wasted motion during movement or processing
Waiting	Sitting idle in anticipation of further value-adding processing
Overproduction	Producing more than current demand requires
Unnecessary Transport	Unnecessary material handling and transportation within and between work centers and sites

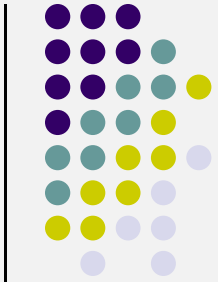
Plus some more…

Too Many Bits and Bytes	Creating and disseminating unnecessary digital information
Untapped Creativity	Failing to utilize human resources to their fullest potential
Poor Measurement	Measuring too much, the wrong areas, incorrectly, or promoting unintended behavior
Excessive Overhead	Time and cost waste from unnecessary staff
Over Design	Designing-in too many components and product features
Duplication of Effort	Developing duplicate processes across similar sites or locations
Poor Planning	Failing to align the supply and demand segments of the supply chain



An Expanded View of Lean
Key Objectives

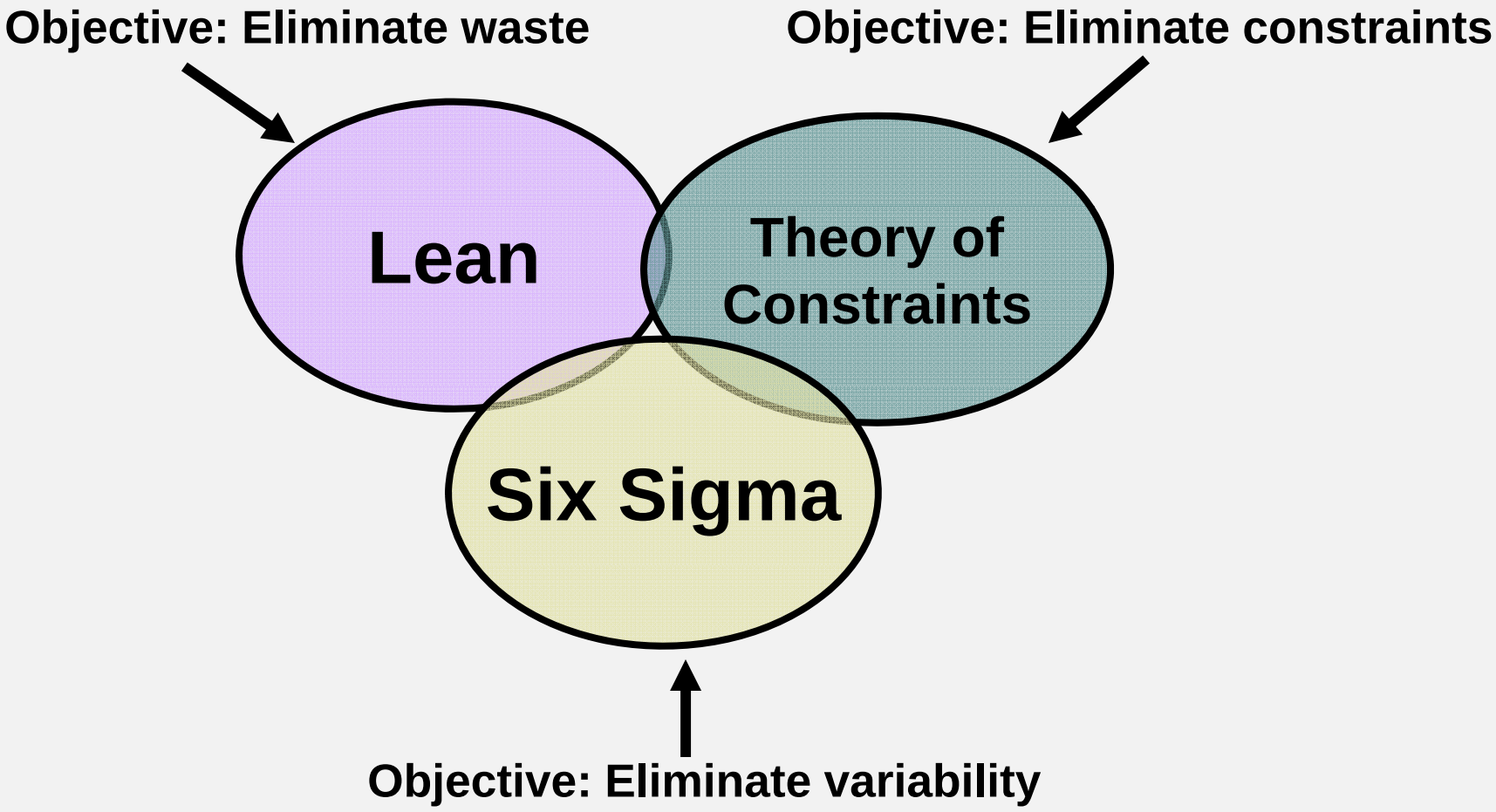
- Understand customers and their requirements
- Keep material and information flowing
  - Amtrak and bottlenecks
  - Air control system
- Pull, don't push
- Make it as perfect as possible
  - Kia and the JD Powers ranking

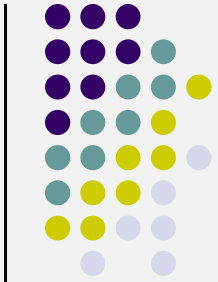


An Expanded View of Lean
Key Objectives

- Optimize across the supply chain
  - UPS
  - Remote telemetry
- Establish the standard
  - Transportation Safety Administration
- Make life simpler
  - F/A-18

The Competing Philosophies

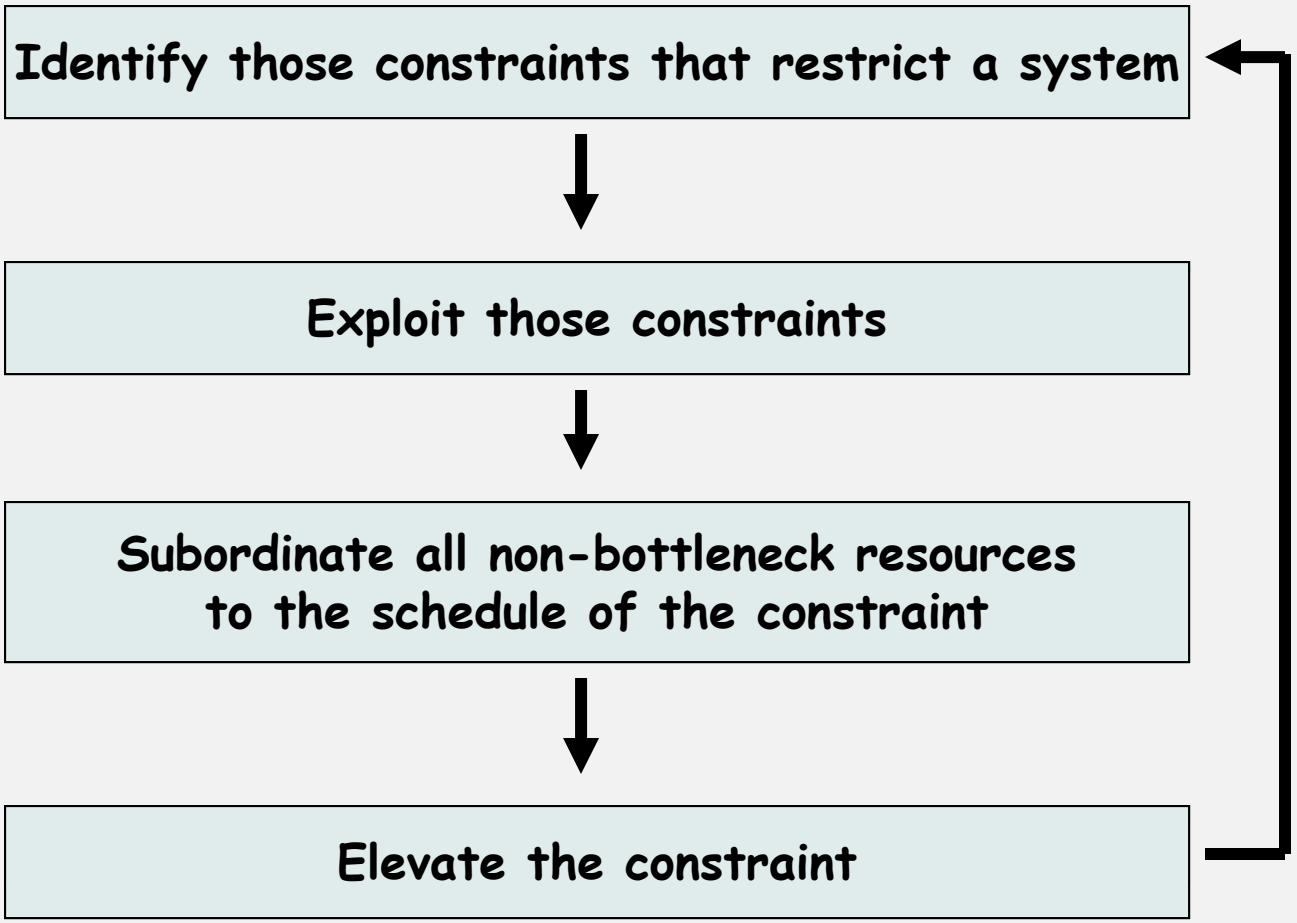




Theory of Constraints

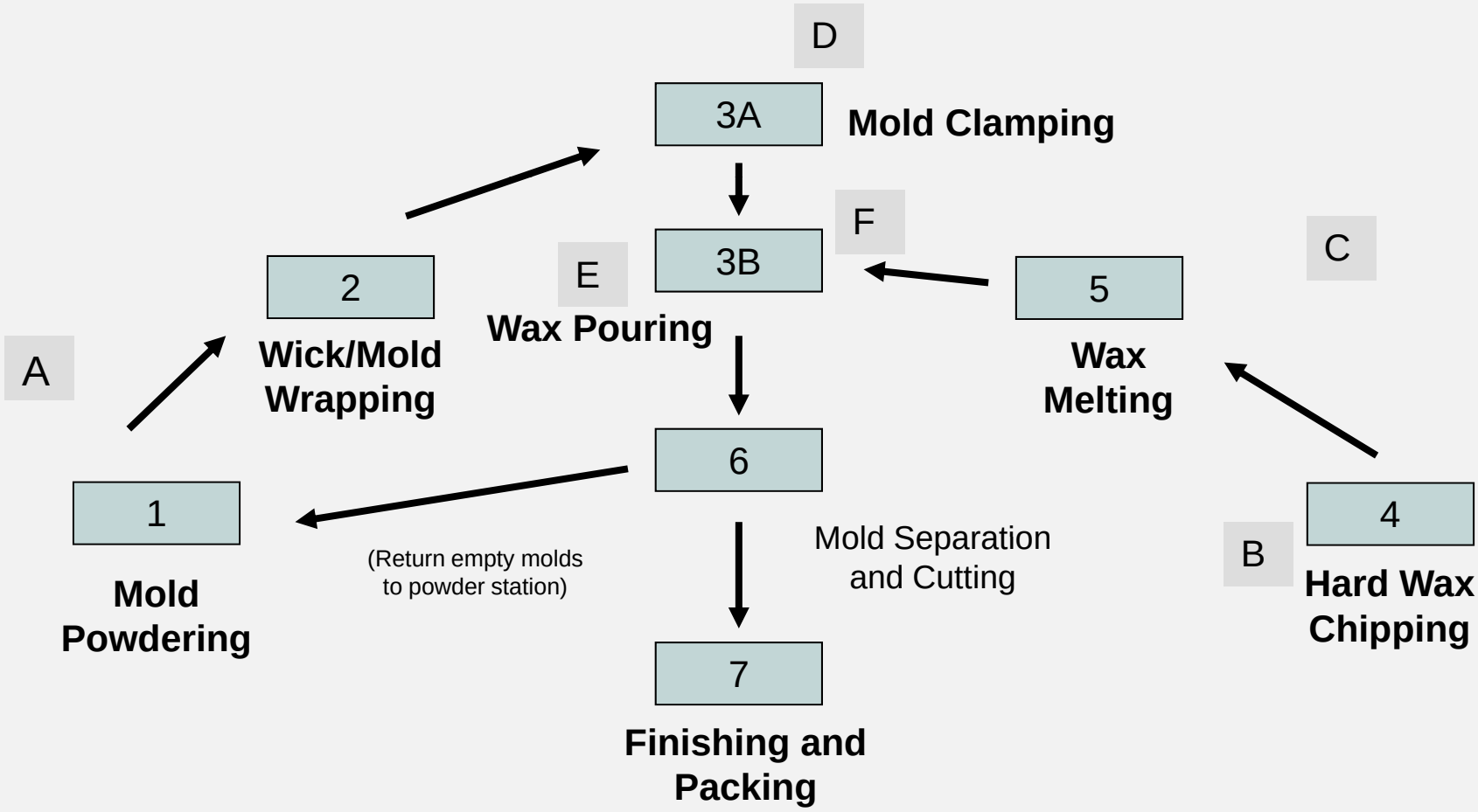
- What is a structural constraint?
- What is a transitory constraint?

TOC Steps

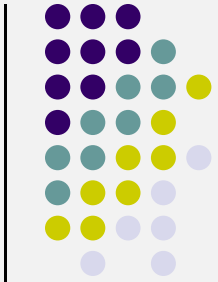

Identify those constraints that restrict a system
Exploit those constraints
Subordinate all non-bottleneck resources to the schedule of the constraint
Elevate the constraint

Source: www.FreeFoto.com

Improving Flow in a Candle Making Process—TOC



Improving Flow in a Candle Making Process—TOC



Bottleneck/Wait Areas

A – Waiting for physical process to be set up

B – Waiting for chipped wax

C – Waiting for wax to melt and inadequate melting capacity (two pots)

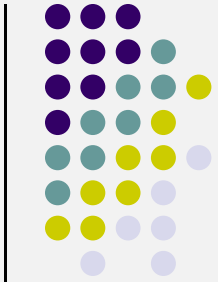
D – Inadequate clamping (i.e., small clamps) causes hot wax leaks through the molds—waste and clean-up

E – Waiting for poured molds to cool before separating—this gets worse as molds retain heat through repeated use during the day

F – Hot wax solidifies in the pouring container, slowing the pouring process

Historic Output: 9 a.m.– 1:00 p.m., 10-12 people, approx. 500-600 candles produced, or 125-150 per hour

Improving Flow in a Candle Making Process—TOC



Bottleneck/Wait Areas—Actions Taken

A – Set up physical process prior to starting work so it is ready when volunteers arrive (plan and stage)

B – Chip all wax into smaller chunks before starting work (keep work flowing)

C – Begin melting wax at 8:15 a.m., double the pots (to four) to melt the wax

D – Purchase stronger (i.e., larger) clamps to prevent leakage, only use two clamps on a mold instead of four (faster turnover and velocity)

E – Place molds in large refrigerator to cool after pouring hot wax (cooling time is cut by about half)

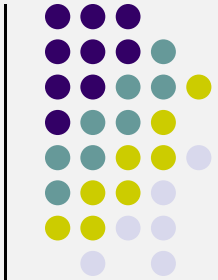
F – Keep the pouring container warm on stove burner between uses—this prevents wax from solidifying (waste reduction)

Production output Fall 2010: 9 a.m. – 11:30 a.m., 10-12 people, 1,003 candles, or 400 per hour

First pass yield: 98.5%

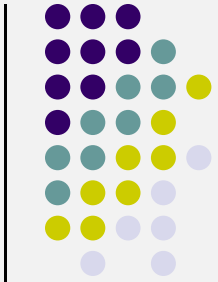
Six Sigma DMAIC Process

Phase	Description
Define	**Define** the customer, their Critical to Quality (CTQ) issues, and the core business process involved. ▪ Define the boundaries of the improvement project. ▪ Define the process to be improved by mapping the process flow. ▪ Identify the customers of the process and their requirements and expectations.
Measure	**Measure** the performance of the business process involved. ▪ Develop a data collection plan. ▪ Collect data from many sources to determine types of defects and metrics. ▪ Compare to customer feedback to determine shortfalls.
Analyze	**Analyze** the data collected and the process map to identify root causes of defects and improvement opportunities ▪ Identify gaps between current and desired performance. ▪ Prioritize improvement opportunities. ▪ Identify sources of variation.
Improve	**Improve** the process by designing creative solution to eliminate the root causes of defects ▪ Create innovative solutions using technology and advanced tools. ▪ Develop and deploy an implementation plan.
Control	**Control** the process to ensure improvements are maintained ▪ Prevent reverting back to previous methods. ▪ Develop, document, and implement an ongoing monitoring plan. ▪ Institutionalize the improvements through the modification of systems and structures.



Supply chain waste from Type I and Type II quality errors

- Searching for quality problems that do not exist
- Delivery delays
- Scheduling delays for subsequent customer orders
- Loss of productivity
- Return logistics cost
- Expediting costs
- Scrap and write-off costs
- Rework costs
- Loss of customer goodwill
- Liabilities and lawsuits
- Brand erosion
- Disruptions to schedules
- Material reordering costs
- Premium transportation costs
- Additional equipment and setup costs to rerun an order
- Performance penalties from customers
- Administrative costs of quality review boards
- Increased inspection and testing costs
- Additional material, packaging, labor, and handling costs
- Human stress
- Interruption to material flow



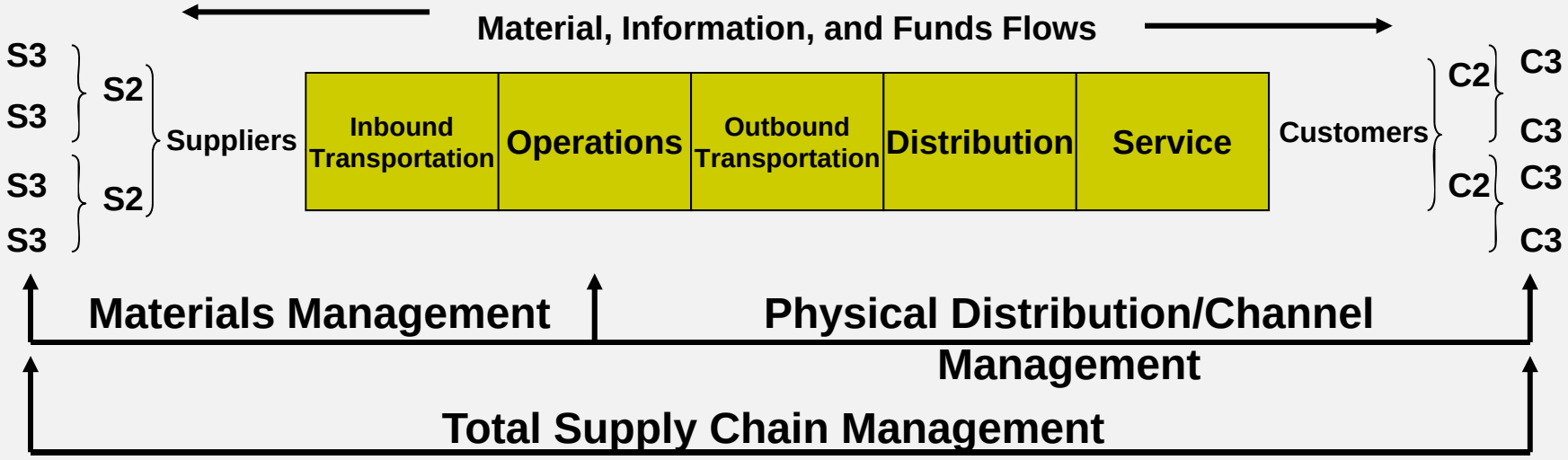
Myths and Realities of Lean: Myth #1

- Lean is about cutting costs
  - Outsourcing to China
  - Dell and Home Depot
  - Some costs could increase with Lean

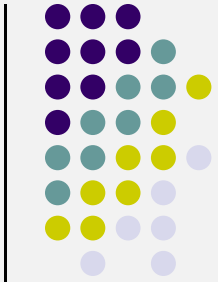
Reality: Lean is not about the short-term pursuit of savings that characterizes many organizations. Removing waste from a system is usually longer-lasting than short-term cost cutting activities.

Myth #2

- Lean is about internal production



Reality: Lean principles can be applied internally to any area. Furthermore, ignoring the importance of Lean across the entire supply chain shows an unhealthy adherence to an outdated idea of Lean



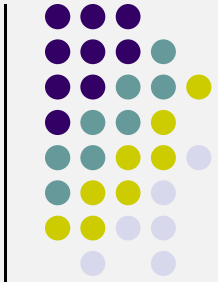
Myth #3

- Lean is for manufacturing companies
  - The historical perspective
  - Analogy: Is quality only for manufacturing companies?

Reality: While some elements of Lean are more conducive to manufacturing firms, the overall philosophy of removing waste is universal. Lean principles are robust and apply to any organization.

Lean Information is Skewed

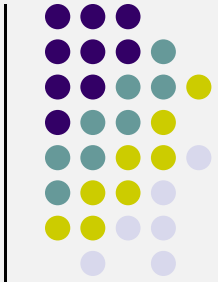
Search Term	Google Results	ABI/INFORM Articles
Lean Manufacturing	2,500,000	1,455
Lean Production	728,000	164
Lean Operations	56,400	118
Lean Procurement	28,300	6
Lean Supply Management	16,800	2
Lean Purchasing	1,400	1
Lean Logistics	31,800	21
Lean Transportation	2,140	0
Lean Distribution	9,340	11
Lean Supply Chain	74,800	49



Myth #4

- Lean is your most important strategic objective
  - Analogy—the case of the bankrupt Malcolm Baldrige winner

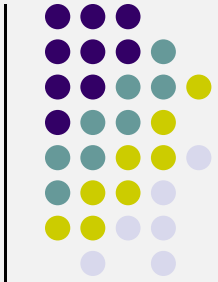
Reality: While Lean is a key strategic objective, it is not the only objective that a firm should emphasize. Examples of other strategic objectives relate to sustainability, ethics, and supply chain integration.



Myth #5

- Lean is a series of techniques
  - The cookie-cutter approach

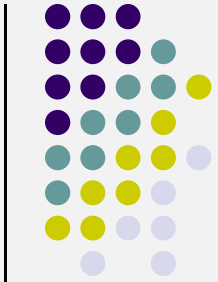
Reality: Lean starts with a vision. After that vision becomes a strategic objective, various techniques and approaches can be put in place to help achieve the Lean vision.



Myth #6

- Lean means just-in-time
  - The comparison to SPC
  - Most organizations will never be part of a JIT system

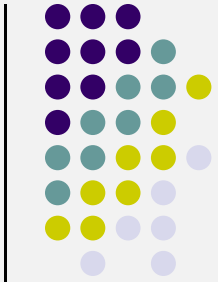
Reality: Lean is a business philosophy while JIT is a delivery system. Interchanging Lean and JIT reveals a serious misunderstanding of Lean.



Myth #7

- You can't be too lean
  - The story of Riken Corporation and the missing piston rings
  - Risk management vs. Lean management: Let the fight begin

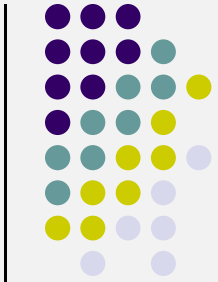
Reality: Firms that have drastically reduced inventory across their supply chain can face severe consequences when something goes wrong. Lean is not only about reducing inventories to their lowest possible level.



Myth #8

- Lean is forever
  - Is Toyota as Lean as they say?
  - Law of entropy

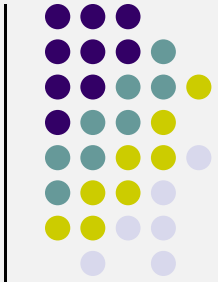
Reality: The pursuit of Lean is a never ending journey. Those firms that believe they have achieved Lean often focus on new objectives and divert resources to other areas, making Lean gains hard to sustain.



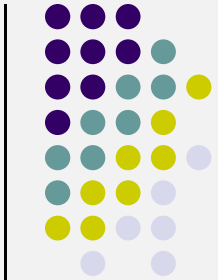
Myth #9

- Lean stifles innovation
  - A major topic of the 2000s
  - Do we view innovation too narrowly?

Reality: Progressive organizations do not view creativity, innovation, and Lean as mutually exclusive. When pursued correctly, Lean thinking promotes rather than inhibits creativity and innovation.



Lean Supply



Creating a Lean Supply Chain
Modules

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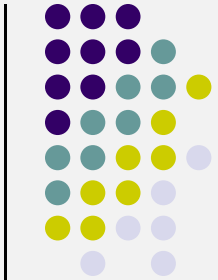
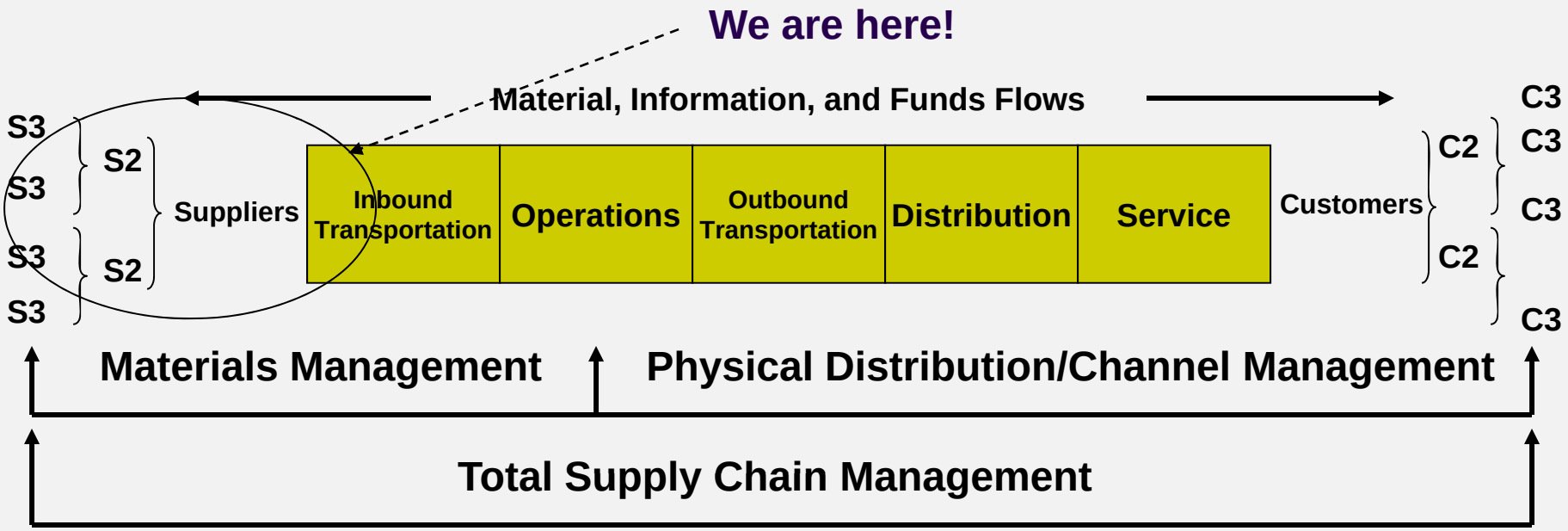
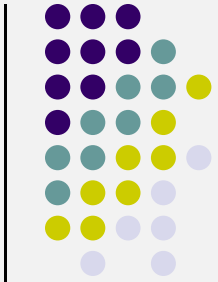


Lean Supply Agenda

- Three perspectives on lean supply…
  - Part I: Selecting and developing lean suppliers
  - Part II: Creating a lean supply network
  - Part III: Practices that promote Lean

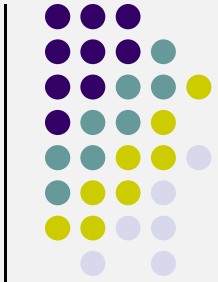
Lean Supply


We are here!
Material, Information, and Funds Flows
S3
S3
S2
S3
S2
S3
Suppliers
Inbound Transportation
Operations
Outbound Transportation
Distribution
Service
Customers
C2
C2
C3
C3
C3
C3
Materials Management
Physical Distribution/Channel Management
Total Supply Chain Management



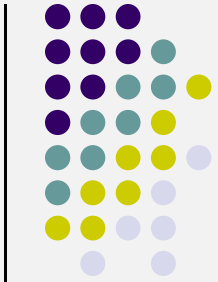
Part I—Selecting Lean Suppliers

- A desire to work with suppliers that are actively pursuing their own lean initiatives should be a major objective during supplier evaluation and selection
- A reliance on lean suppliers is not only so the buyer can do business with suppliers that have the capability to deliver smaller quantities more frequently
- If we expect our internal operations to drive out waste and become lean, why shouldn't we expect external providers to be lean, also?



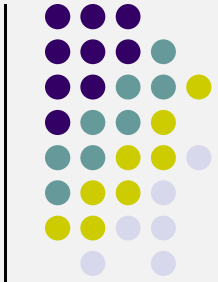
Selecting Lean Suppliers

- Suppliers that focus on lean should have a definite cost advantage that can be passed along to the buyer in the form of lower unit costs
- Lean suppliers will have addressed the flow of material and information through their operations, and the effect that flow has on capacity should not be understated or underestimated



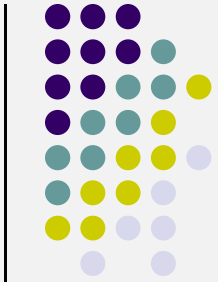
Selecting Lean Suppliers

- How might a constant search for lower prices affect our lean supply chain objectives?



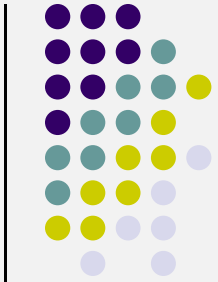
Part II—Creating a Lean Supply Network

- Lean supply is a key element of the lean supply network
- A network is an *interconnected or interrelated chain, group, or system*. In this case, a lean supply network consists of a group of suppliers that are willing to work with a buyer to produce and deliver, more frequently, smaller quantities of material



Part II—Creating a Lean Supply Network

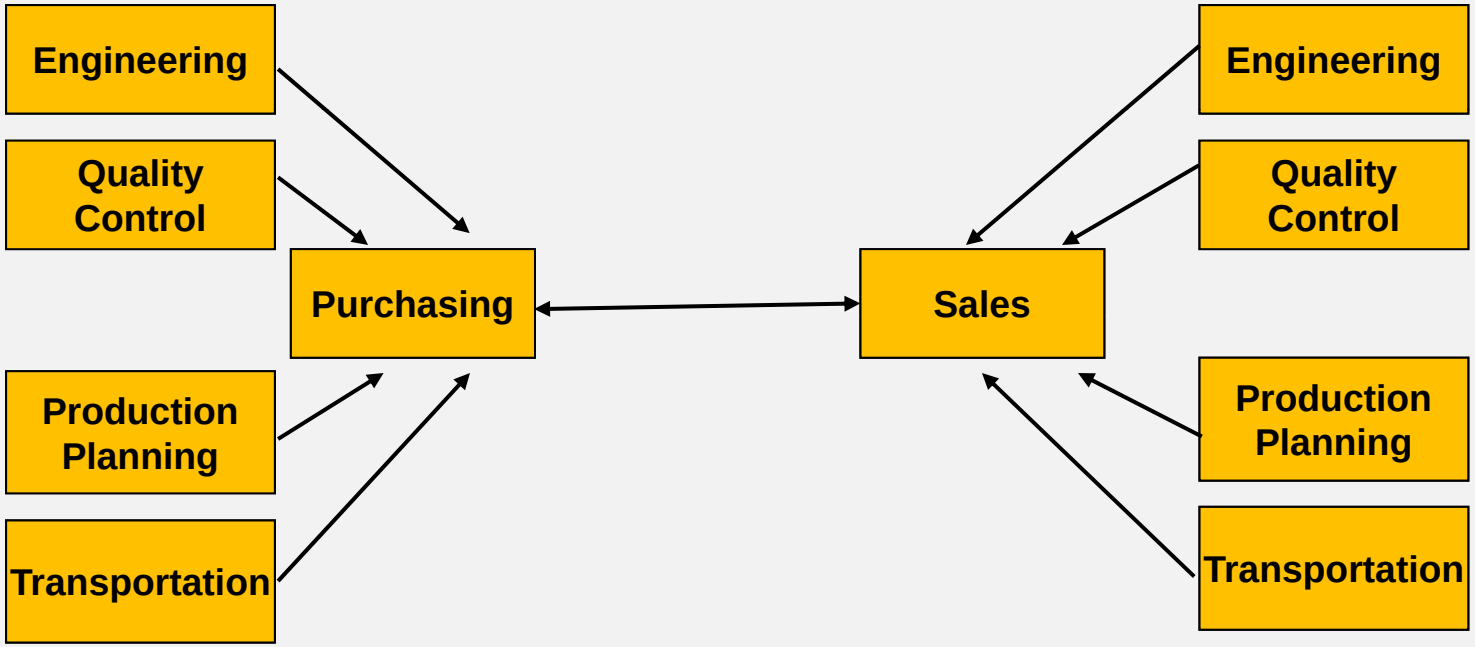
- Characteristics of lean supply—
  - Purchase in smaller average quantities with frequent deliveries
  - Mutual, consistent improvement by the buyer and supplier
  - Collaborative efforts between buyer and supplier
  - Efficient communication linkages
  - The “rights”—
    - right quantity
    - right time
    - right quality



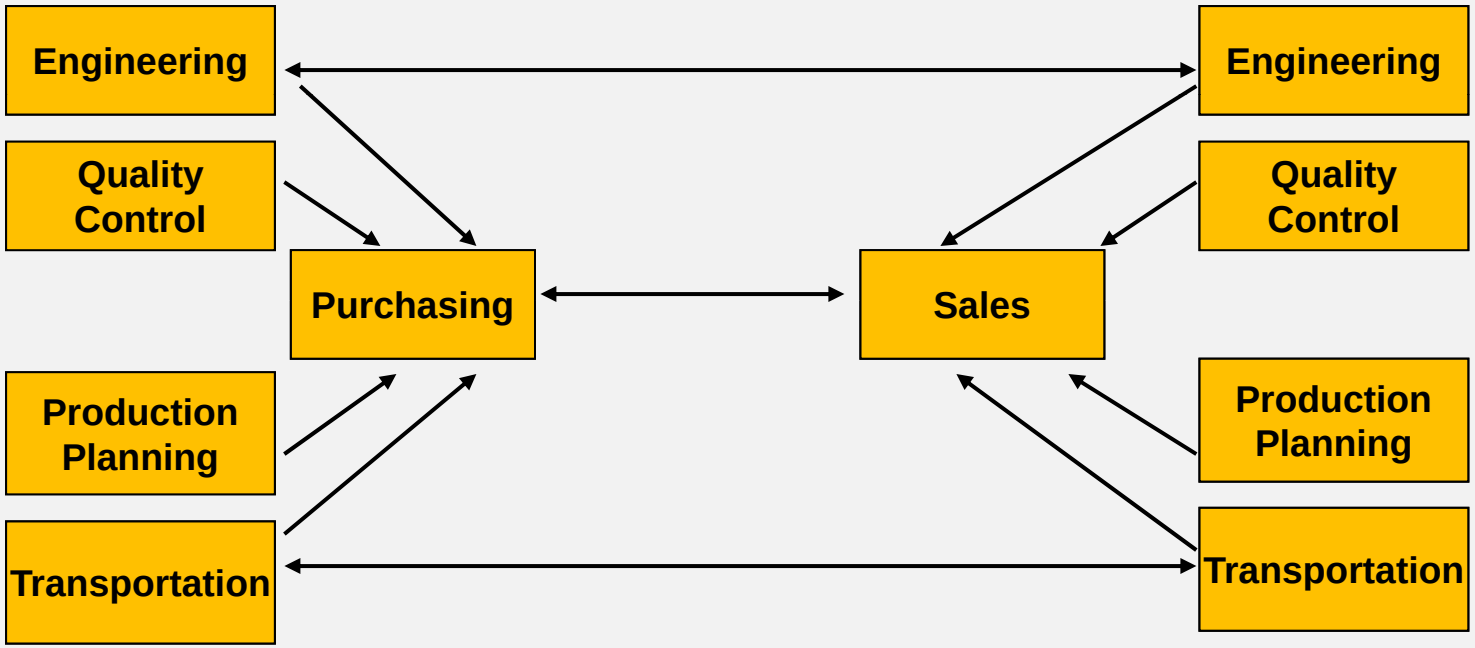
Identifying items that are best suited for just-in-time or lean supply

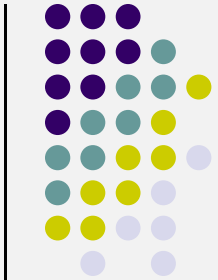
- What not to do—
  - The case of corrugated boxes
  - The case of the fasteners

Traditional Communication Linkages



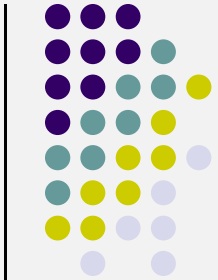
Point-to-Point Communication Linkages





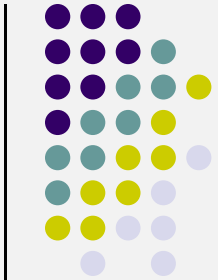
Lean Supply

- *Possible challenges facing firms when pursuing lean with suppliers—*
  - Size of supply base
  - Geographic dispersion
  - Incomplete communication and information sharing
  - Inconsistent supplier quality
  - Historical relationship between buyers and sellers
  - *How can firms counter these challenges?*



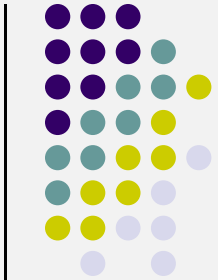
Part III—Lean Supply Management Practices

- The third part of lean supply involves a range of activities and approaches that help remove cost and redundancy from the supply management process
  - Rationalizing the supply base
  - Developing a world-class supplier selection process
  - Reducing redundancy across buying sites and locations
  - Developing longer-term supply agreements
  - Pursuing supplier development activities
  - Establishing low dollar purchase systems



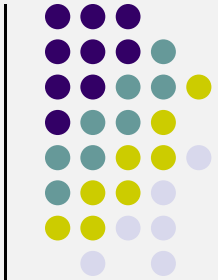
Think about what a rationalized supply base featuring fewer suppliers means within the context of lean:

- Fewer contracts or purchase orders to negotiate and write
- Fewer material releases
- Less effort expended to process and handle materials receipts
- Easier material traceability
- Fewer supplier performance reviews
- Better communication with suppliers



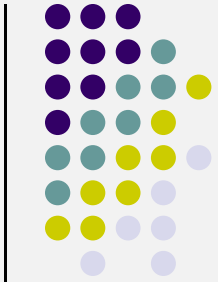
Think about what a rationalized supply base featuring fewer suppliers means within the context of lean (continued):

- More attention given to supplier selection, thereby improving the effectiveness of that process
- Fewer accounts payable transactions
- Fewer Requests for Proposals to manage
- Improved supply base quality and delivery performance
- Lower purchase unit costs

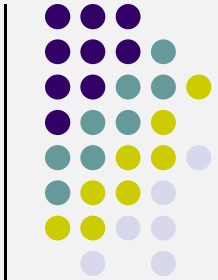


The following is a sample of systems that make the supply process more efficient and lean, particularly ***when obtaining low dollar items***:

- Purchasing cards issued to internal users
- Blanket purchase orders that allow internal users to order directly from suppliers
- Online catalogues
- Electronic requisitions issued to procurement
- Electronic purchase orders issued to suppliers
- On-site suppliers to manage inventory
- Electronic funds transfer to suppliers
- Allowing internal users to issue purchase orders below a dollar limit

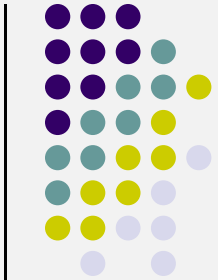


Lean Transportation



Creating a Lean Supply Chain
Modules

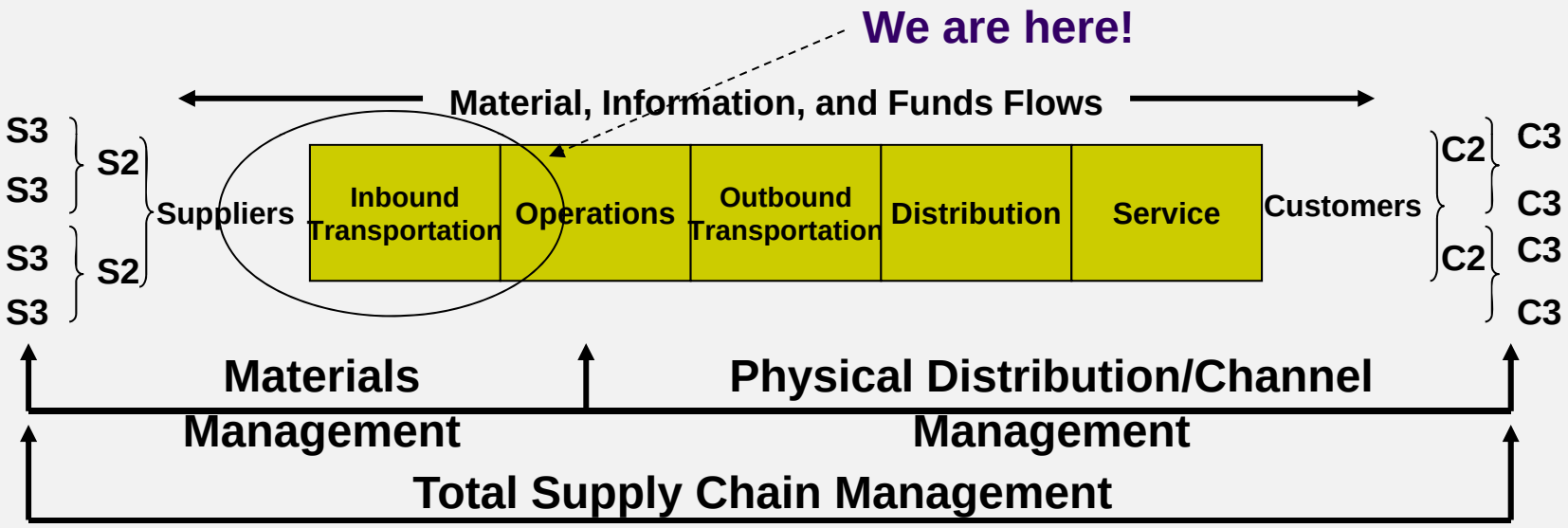
- Part I: Lean Overview
- Part II: Lean Supply
- **Part III: Lean Transportation**
- Part IV: Lean Operations
- Part V: Lean Distribution
- Part VI: Lean Measurement and Tools

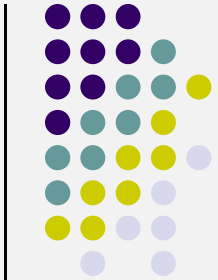


Lean Transportation Agenda

- Understand how transportation deregulation opened the door for transportation innovation
- Appreciate the different kinds of transportation carriers and transportation trade-offs
- Present the key characteristics of lean transportation
- Examine some of the transportation trends and innovations that may affect lean and supply chains

Lean Transportation





U.S. Spends over $1.2 Trillion Annually on Logistics

Inventory carrying costs: $396 Billion

Transportation costs: $768 Billion

Logistics administrative costs: $47 Billion

Source: CSCMP *Annual State of Logistics Report*

Transportation Deregulation

Law	Comments
Air Cargo Deregulation Act (1977)	✓ Eliminated economic regulation and permitted air carriers to publish cargo rates with approval of the Civil Aeronautics Board ✓ Allowed rate negotiation between shippers and carriers ✓ Reduced the barriers to entry for new carriers
Air Passenger Deregulation Act (1978)	✓ Freed carriers from government regulation over passenger fares ✓ Reduced barriers to entry for new carriers
Motor Carrier Act of 1980	✓ While still requiring published tariff rates, the law allowed carriers to offer discounts from published rates ✓ Made it easier to obtain a *Certificate of Public Convenience and Necessity*, opening the door for new entrants to offer service ✓ Allowed public and private carriers to haul a wider range of goods ✓ Ended restrictions on contract carriage
Staggers Act (1980)	✓ Provided rate-making flexibility ✓ Allowed railroads to enter into long-term contracts with shippers ✓ Deregulated a form of inter-modal transportation called “piggyback”
Transportation Industry Regulation Reform Act (1994)	✓ Deregulated intrastate trucking ✓ Eliminated the need for carriers to file rates and notices of rate changes ✓ Provide rate-making confidentiality between carriers and shippers ✓ Allowed off-bill discounting ✓ Removed some anti-trust exemptions for rate making bureaus
ICC Termination Act (1995)	✓ Eliminated most remaining truck regulation ✓ Established the Surface Transportation Board ✓ Formally eliminated the Interstate Commerce Commission
Ocean Shipping Reform Act (OSRA) 1998	✓ Allows liner carriers and shippers to enter into confidential service contracts ✓ Although contracts are still filed with the Federal Maritime Commission they are no longer public

Transportation is a Fragmented Market in the U.S.

Interstate Motor Carriers, Marine Vessel Operators, and Class I Railroad Operators

	1970	1975	1980	1985	1990	1995	2000	2005	2006
Marine vessel operators	U	U	U	U	U	1,381	1,114	733	682
Class I railroads	71	73	39	25	14	11	8	7	7
Interstate motor carriers	U	U	U	U	216,000	346,000	560,393	679,744	692,789
Air carriers	39	36	63	102	70	96	91	85	87

U = Data unavailable
Source: http://www.bts.gov/publications/national_transportation_statistics

Transportation is a Fragmented Market in the U.S.

Interstate Motor Carriers, Marine Vessel Operators, and Class I Railroad Operators

	2007	2008	2009
Marine vessel operators	707	652	628
Class I railroads	7	7	7
Interstate motor carriers	711,792	715,011	726,928
Air carriers	87	88	76

U = Data unavailable
Source: http://www.bts.gov/publications/national_transportation_statistics

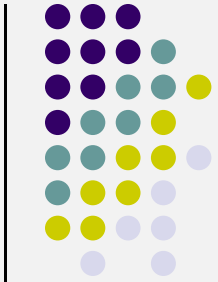
Piggyback—Container on Flat Car (COFC)

In the 1950s container use started to revolutionize freight transportation. The United States Department of Defense produced specifications for standard containers for military use of 8-foot (2.4 m) by 8-foot (2.4 m) square cross section in units of 10-foot (3.0 m) long. The International Organization for Standardization (ISO) issued standards based upon the U.S. Department of Defense standards between 1968 and 1970, ensuring interchangeability between different modes of transportation worldwide. These rectangular stackable containers became known as ISO containers.

In the U.S., starting in the 1960s the use of containers increased steadily. Rail intermodal traffic tripled between 1980 and 2002, according to the Association of American Railroads (AAR), from 3.1 million trailers and containers to 9.3 million.

Piggyback—Trailer on Flat Car (TOFC)

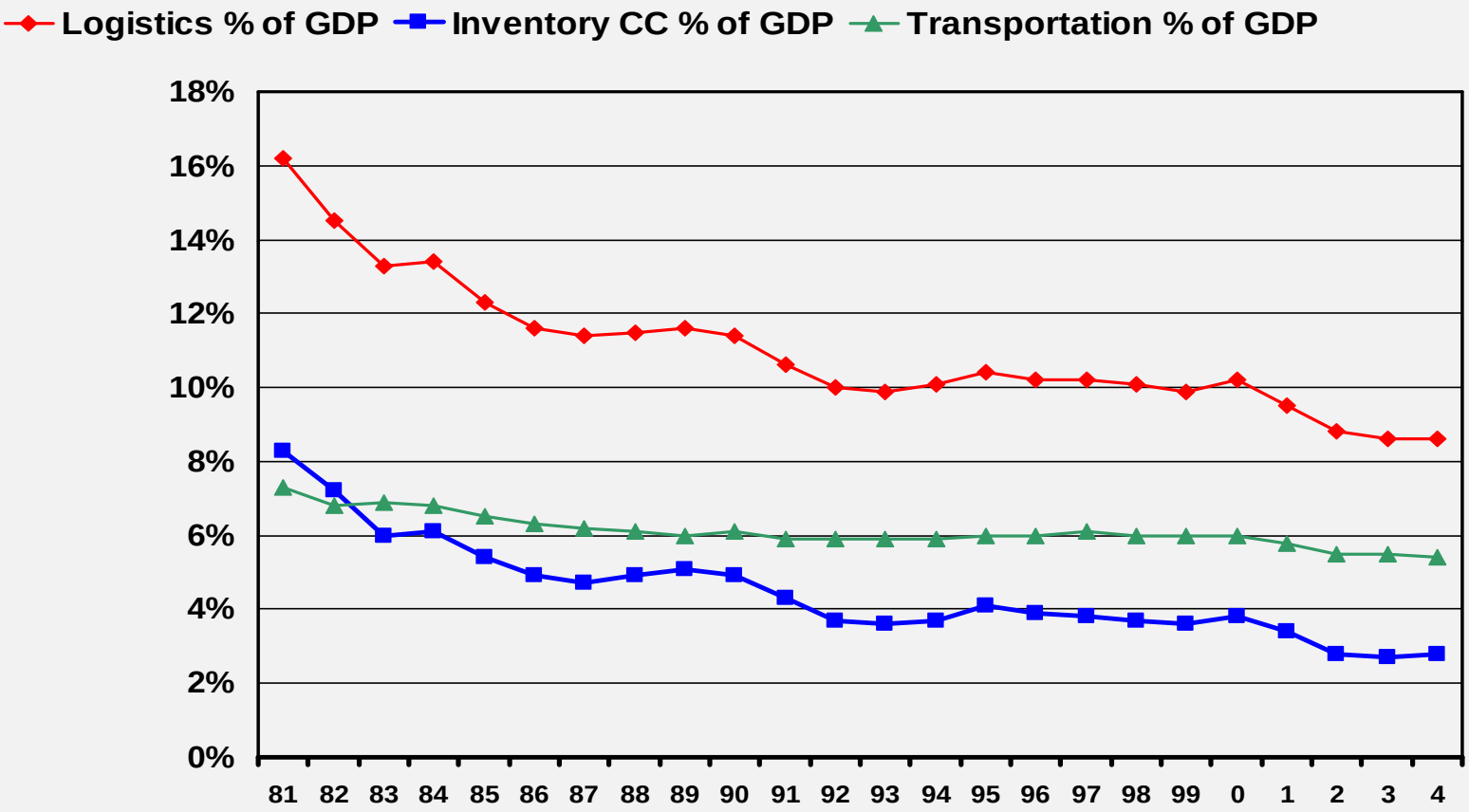
Truck trailers were first carried by railway before World War II, an arrangement often called "piggyback", by the small Class I railroad, the Chicago Great Western in 1936.



Lean Transportation

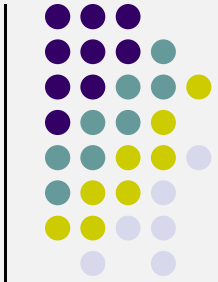
- Was deregulation successful in driving waste from the U.S. transportation system? Why or why not?

Cost of Logistics Relative to GDP



Source: CSCMP, *Annual State of Logistics Report*

Lean Transportation

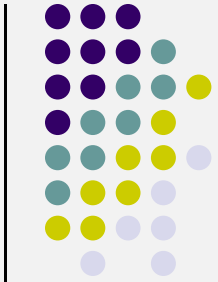


- What is…

a common carrier?

a contract carrier?

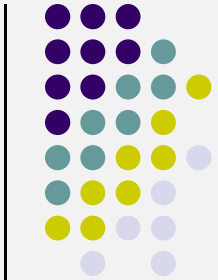
a private carrier?



Supply Chain
Trade-Offs

- Trade-offs require a balancing of factors or objectives that cannot all be attained at the same time. The presence of a trade-off means *giving up one thing in return for another*.

- Functional groups that are unwilling to "give anything up" as they concentrate on their own, and often narrow objectives may find themselves in direct conflict with other groups.



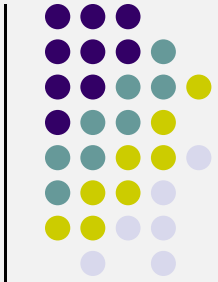
The World of Supply Chain
Trade-Offs

Lot Size-Inventory Trade-Off

While larger lot sizes provide production efficiencies, demand rarely comes in large or standard lot sizes. Large lots lead to high inventory that is held in anticipation of demand.

Inventory-Transportation Cost Trade-Off

Aggregating material movements allows fewer and larger shipments and reduced transportation costs. Less frequent material movement, however, requires holding inventory and possible decreases in customer service.



The World of Supply Chain Trade-Offs

Lead Time-Transportation Cost Trade-Off

Transportation costs are lowest when large quantities of items are transported between stages of the supply chain, creating longer-lead times and higher inventory carrying costs.

Product Variety-Inventory Trade-Off

Increased variety and features create new part numbers, which affects forecasting complexity, product placement across the supply chain, product costs, transportation costs, and inventory levels.

The World of Supply Chain Trade-Offs

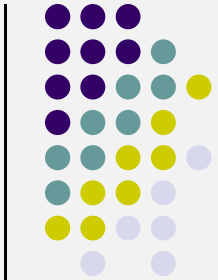
Cost-Customer Service Trade-Off

Increased customer service levels usually require higher inventory levels and faster delivery, which increases inventory and transportation costs.

Lean-Risk Management Trade-Off

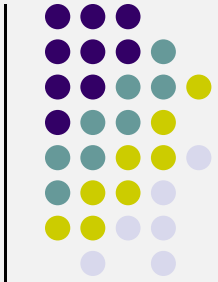
A focus on risk management has caused some companies to take supply chain actions that do not align well with lean objectives.

Adapted from D. Simchi-Levi, P. Kaminsky, and E. Simchi-Levi, Designing and Managing the Supply Chain, 2003.



Lean Transportation Characteristics

- Replacement of expendable packaging with reusable containers
- Frequent deliveries made to the point of use
- Regular and repeatable delivery schedules (closed loop systems—see next slides)
- Long-term dedicated contract carriage replaces commercial carriage as the primary mode of transportation

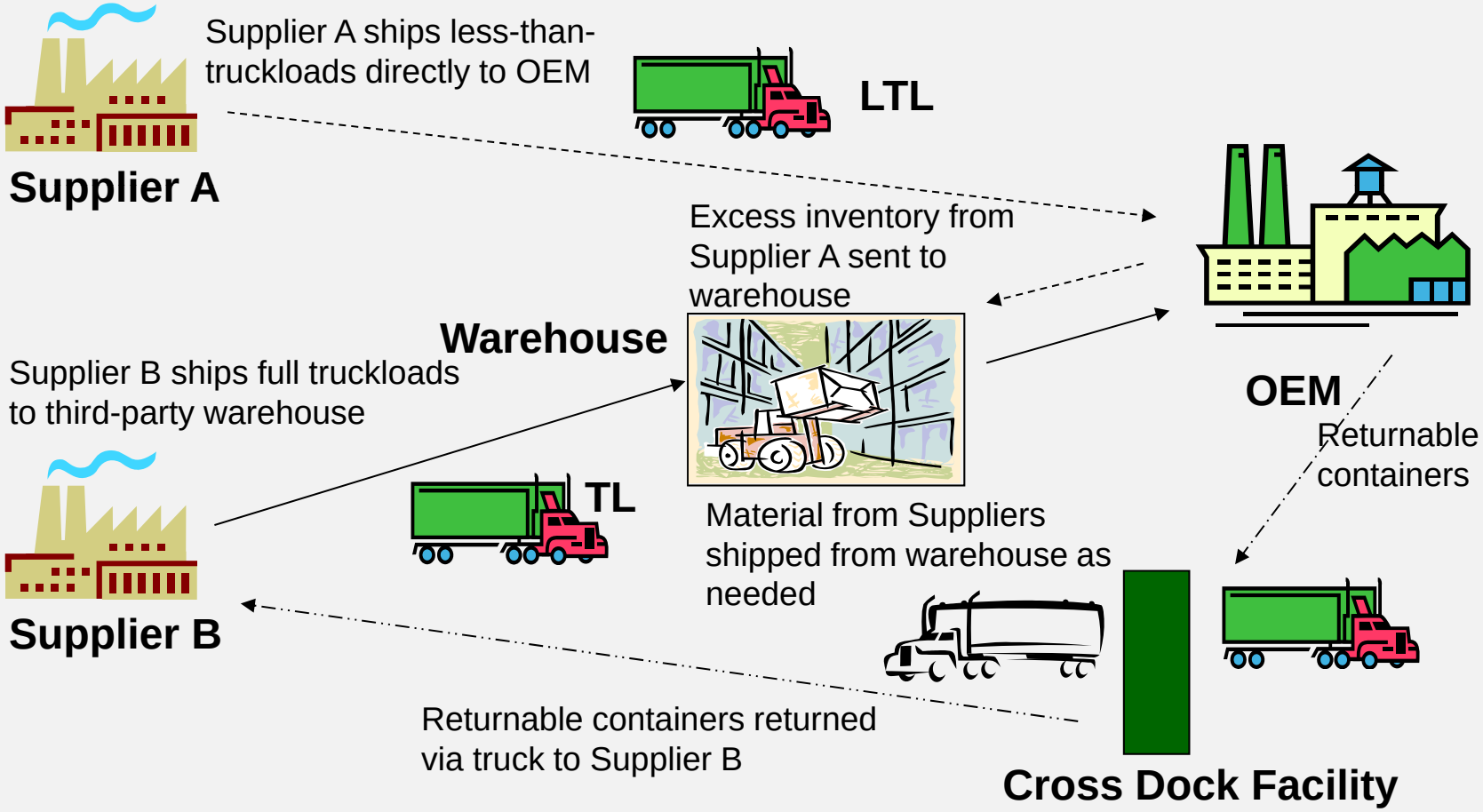


Lean Transportation Characteristics

- Equip trucks with telematics units
- Focus on frequent deliveries of small quantities of many parts versus large quantities of fewer parts
- Real time IT systems
- Modified shipping and handling equipment
  - Side loading trucks
  - Smaller trucks (similar to beverage trucks)
  - Point of use doors at production facilities

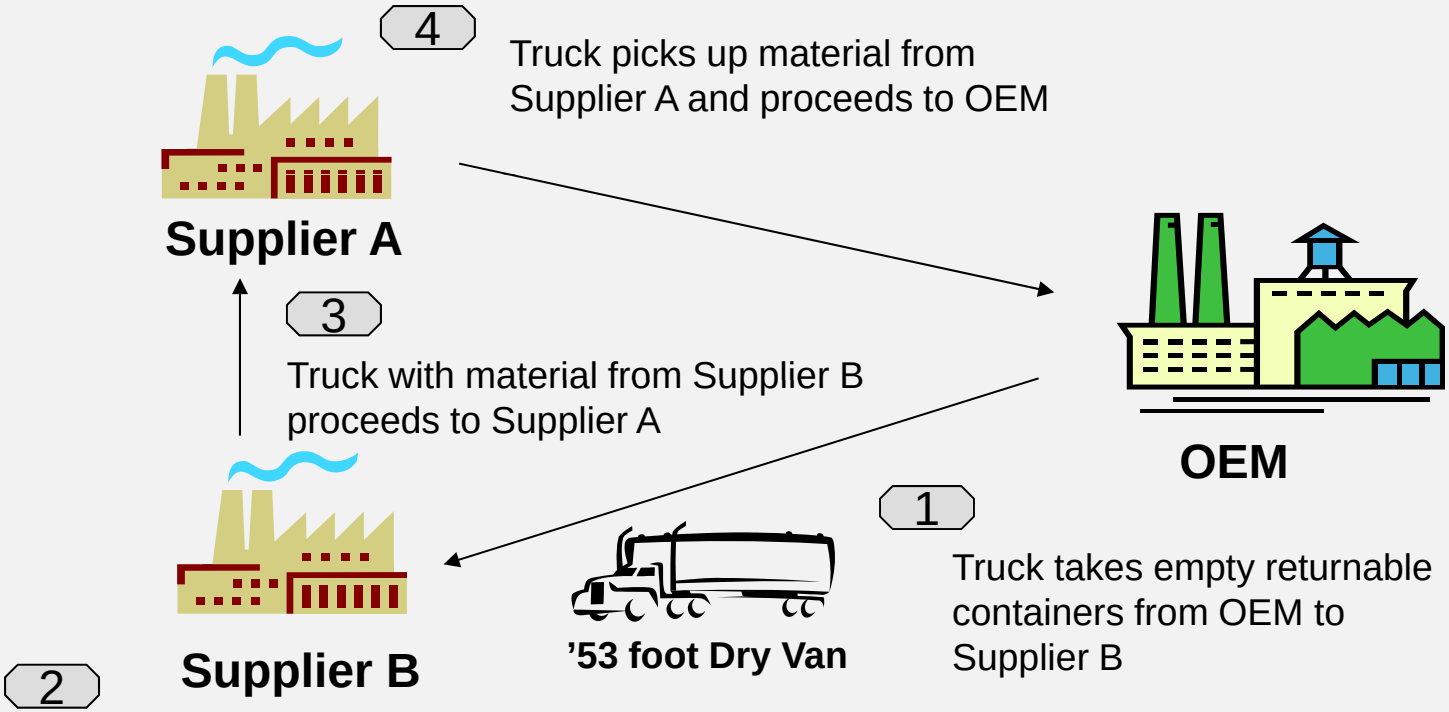
Traditional Transportation System

Before

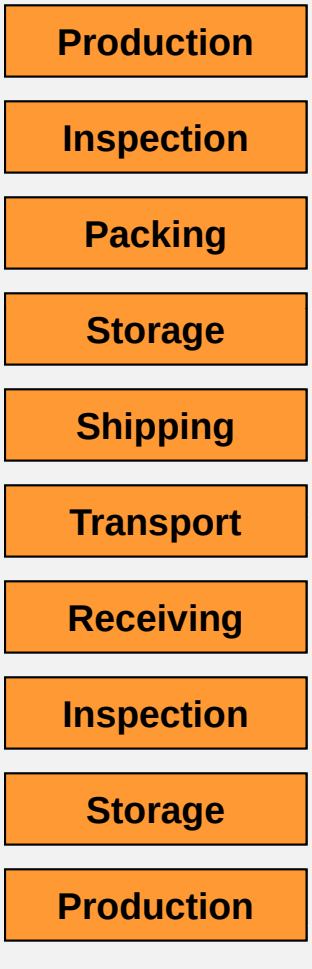


A Closed-Loop Transportation System

After



Lean Transportation

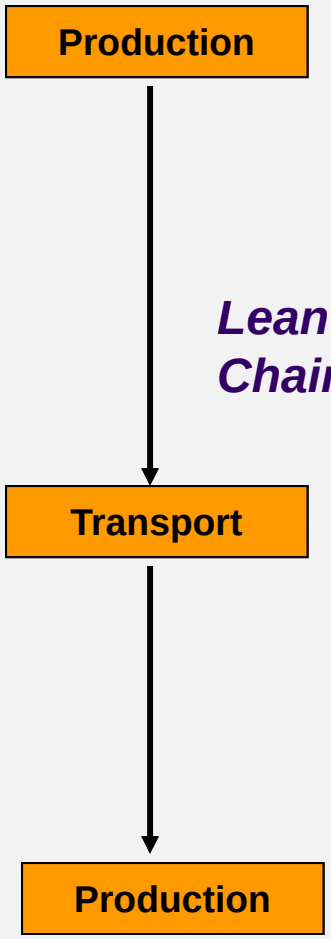


Traditional Supply Chain

Supplier

Transport

Customer



Lean Supply Chain

Designing a Lean Transportation Network

Organizational Structure:
Change the organization
to meet Lean requirements

Number of Carriers:
Reduce the number of carriers to four
or fewer--one for each region

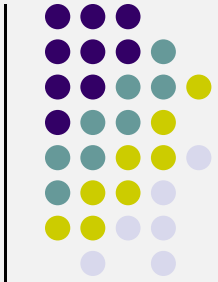
Contract Basis:
Put transportation
services on a contract or
dedicated basis

Designing a Lean Transportation Network

Computer Interface:
Establish computer interface with carriers

Regular Pick up and Delivery:
Pick up freight from suppliers and deliver on a scheduled basis

Efficient Handling Equipment:
Use state-of-the-art technology and handling equipment



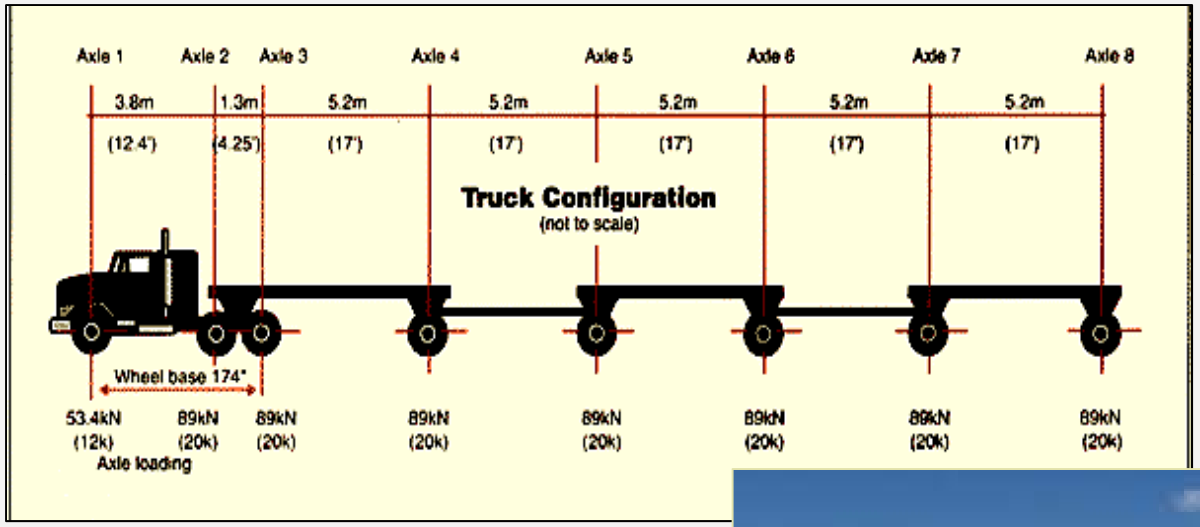
Transportation and handling changes and innovation that may affect lean and supply chains…


DREAM


DREAM LIFTER


BOEING
DREAM LIFTER

Will triple trailer trucks become more commonplace?

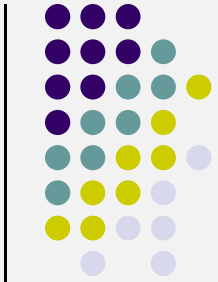


How will the increased doubling of capacity of the Panama Canal affect transportation and distribution?

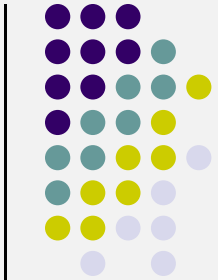
How will a consolidation of rail carriers affect supply chains?

Four rail carriers (Norfolk Southern, CSX, Union Pacific, and BNSF) control 90% of rail freight in the U.S.

The coming of mega (and fast) container ships 18,000 TEU's



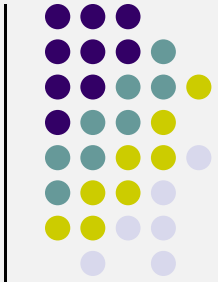
Lean Operations



Creating a Lean Supply Chain

Modules

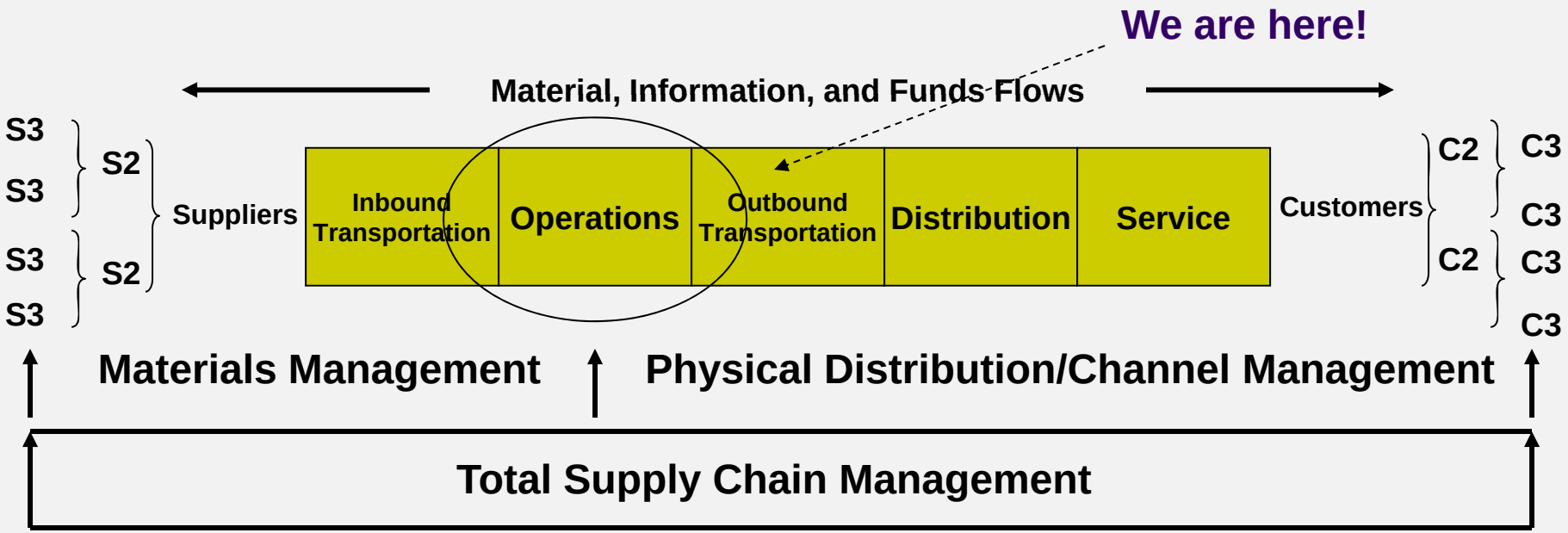
- Part I: Lean Overview
- Part II: Lean Supply
- Part III: Lean Transportation
- **Part IV: Lean Operations**
- Part V: Lean Distribution
- Part VI: Lean Measurement and Tools

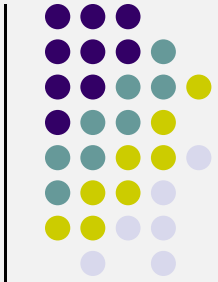


Lean Operations Agenda

- Review five major elements of lean operations
  - Setup time reduction
  - Facility layout changes
  - Uniform loading
  - Level scheduling
  - Pull systems

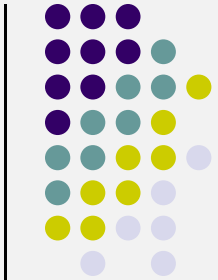
Lean Operations





Elements of Lean Operations

- **Setup time reduction**
  - True or False. Setup times are essentially non value-adding activities
  - Why must we reduce setup times when pursuing Lean?
  - What are some ways to reduce setup times?
  - Any obstacles to reducing setup times?



Setup Time Reduction

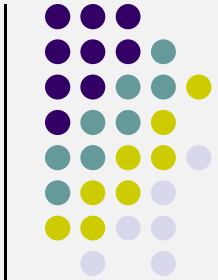
The systematic process of minimizing equipment downtime between part number changeovers to facilitate small lot production.

Analogy—Moving from a traditional tire change to a racing pit stop

Setup Time Reduction Objectives

- Support small lot production
- Reject the EOQ formula

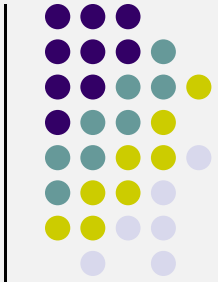
  Dependence on the formula focuses attention on the answer instead of the inputs that produce the answer



Setup Time Reduction Objectives (continued)

- Produce all items frequently, it not daily
- Evolve to a lot size of one
  To achieve this, setups must become a non-event
- First piece conforms every time

Many companies start their lean operational efforts with setup time reduction—This usually turns out to be one of the easiest and most important elements to implement.



How do we reduce setup times?

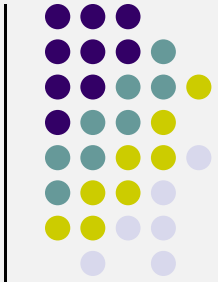
1. Eliminate downtime
   - Plan and stage
     - Know what part requirement is coming next
     - Know when the change will take place
     - Have the required tools, equipment, personnel and materials ready before the change
   - Use wheels and rollers
     - Ability to move quickly without material handling equipment

How do we reduce setup times? (continued)

2. Improve setup methods
   - Time and motion study
   - Eliminate threads (i.e., nuts and bolts)
   - Practice setup activities between workers (like a pit stop crew)
   - Use operators to setup versus a specialized machine setup person
   - Reduce fitting, adjusting, and calibrating requirements

How do we reduce setup times? (continued)

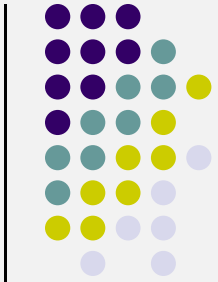
3. Eliminate on-machine adjustments
   - Transfer as much internal setup work to external work as possible
     - For example, preset or pre-adjusted tooling
   - Simply and standardize equipment and tooling
4. Use new and duplicate equipment as required
5. Track setup reduction progress over time
   - Set Stretch goals



Facility Layout Changes

Objective—Overcome the limitations of traditional layouts

- Excessive material movement
- Worker specialization
- Complex tracking requirements
- Constrained flow
- Lack of ownership

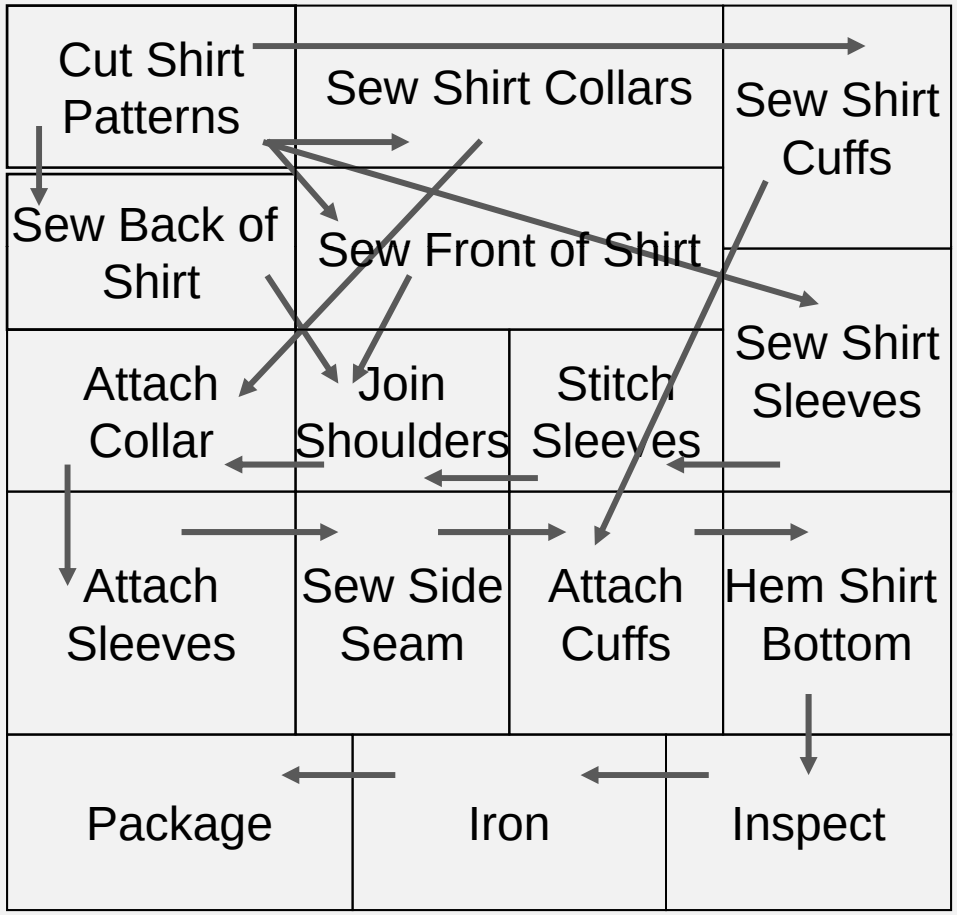


Facility Layout Changes

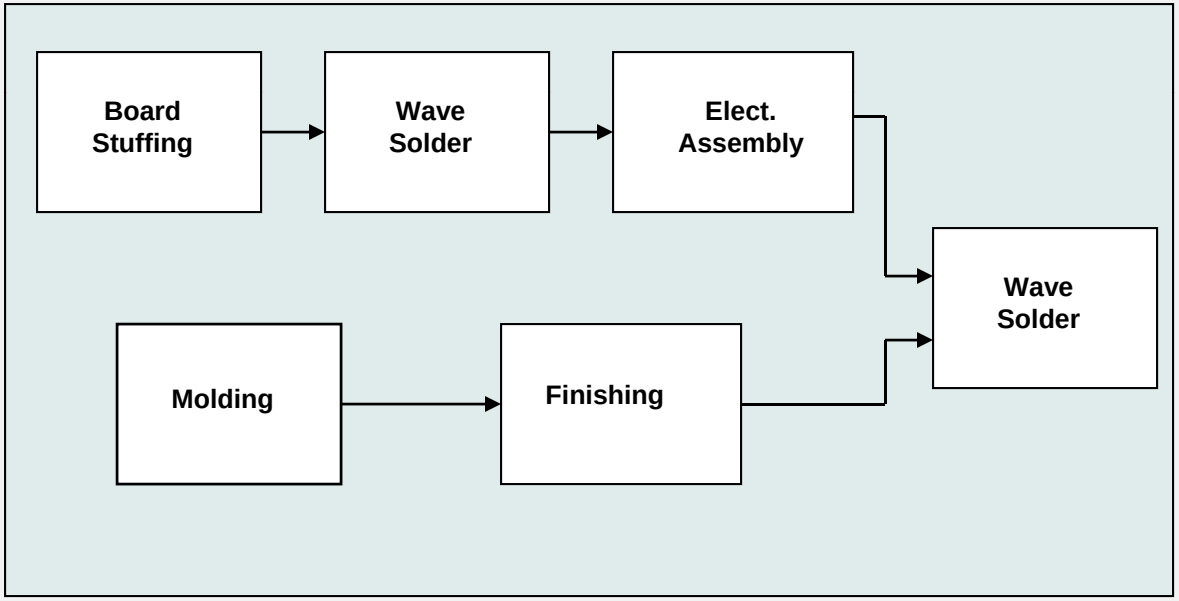
Batch and job shop environments often use cellular manufacturing or layouts

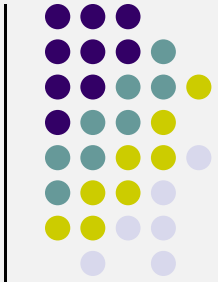
- Group dissimilar operations together
- Cell must lend itself to visibility and scheduling and worker flexibility
- Cell grouping allows people to work together in teams

The Travels of Dress Shirts in a Process Layout



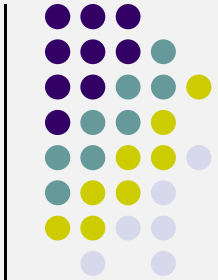
Cellular layout simplifies and reduces part and material movement





Elements of Lean Operations

- Facility layout changes
  - What are the benefits we hope to realize from better layouts?
  - What are some challenges when changing layouts?

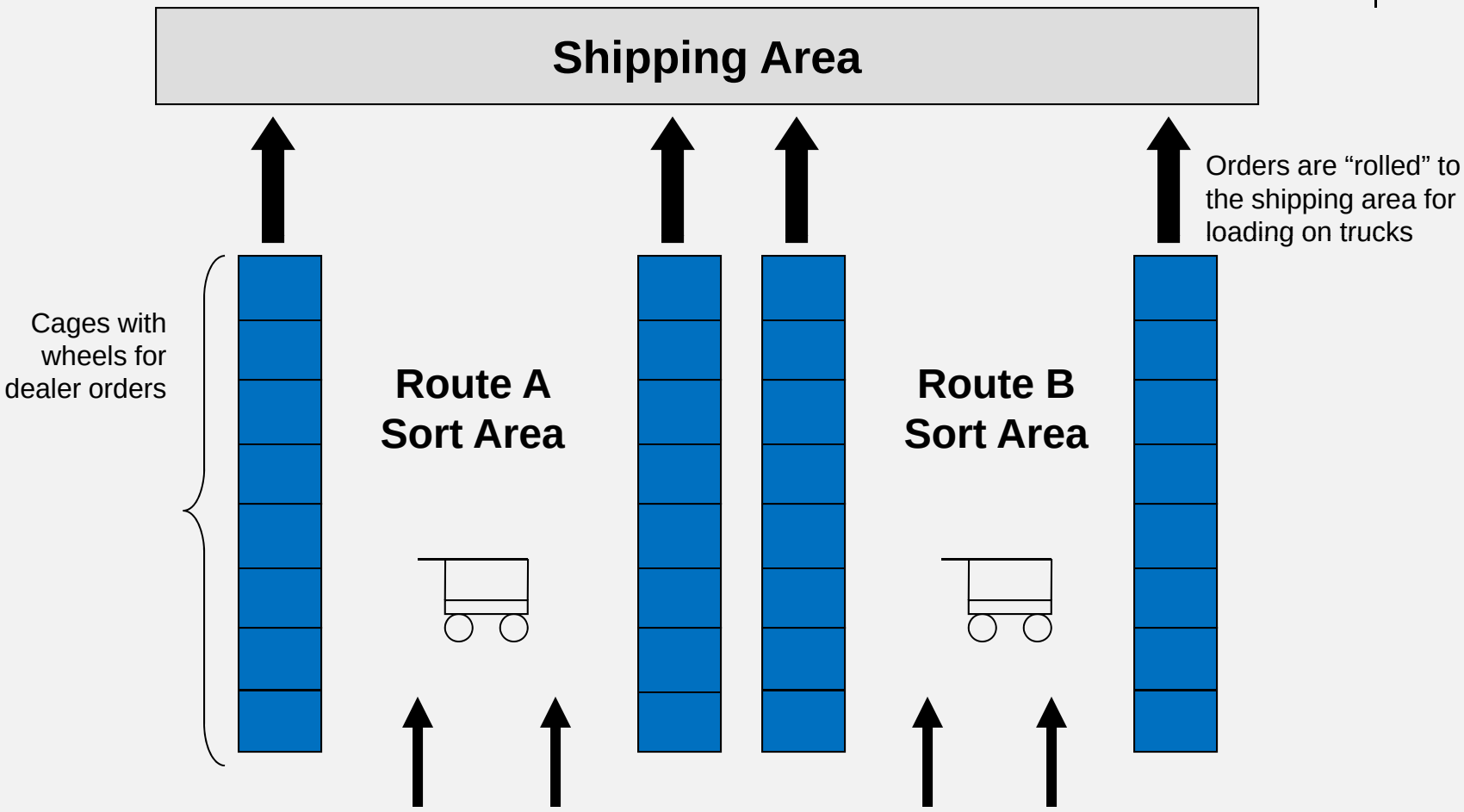


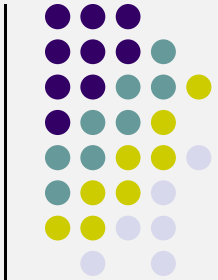
Challenges associated with facility layout changes:

- Changing the role of departmental specialization
- Some equipment does not lend itself to being grouped with other equipment
- Rearranging a facility is a major risk
- Equipment utilization often falls in a lean environment

Concern with factory utilization must shift to a concern with low inventory, balanced production and quality assurance

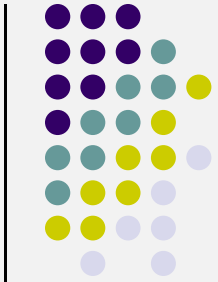
A Distribution Layout Focusing on Flow





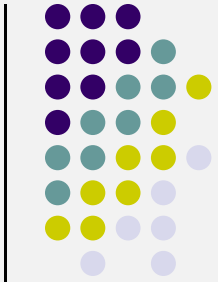
Elements of Lean Operations

- **Uniform loading**
  - This is called *uniform plant loading* by traditionalists
  - Should we really say *uniform supply chain loading*?
  - The entire production process must be linked together and balanced so there is a steady flow of material throughout the facility with no queues or shortages



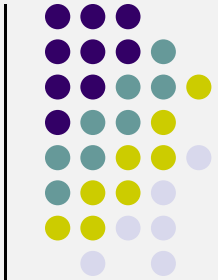
Elements of Lean Operations

- **Uniform loading**
  - What does it mean to say that “each work center is not independent?”
  - What are some ways to pursue uniform loading?
  - Any examples of uniform loading in practice?



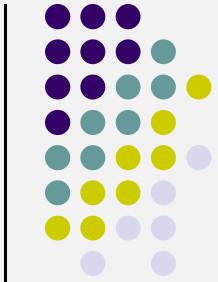
Elements of Lean Operations

- **Level scheduling**
  - This involves building the same product mix or performing similar work every day during a given period
  - Level loading works best with fairly consistent patterns of customer demand, at least in the short run
  - The starting point for a balanced production process is a level final build schedule or load within a facility and, ideally, a supply chain
  - What is *takt* time?



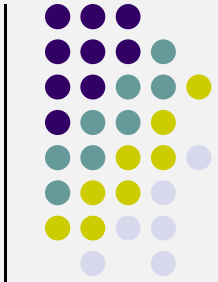
Elements of Lean Operations

- **Pull systems**
  - What does “pull” mean?
  - What are the challenges we might face when shifting from a push to a pull system?
  - What is a *kanban*?
  - What are some examples of *kanbans?*



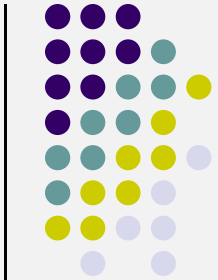
Inventory Pull Systems

- Customer orders “pull” required materials and production through a facility
- Cells or work centers only make a product, subassembly or component when requested by a downstream work center



Inventory Pull Systems

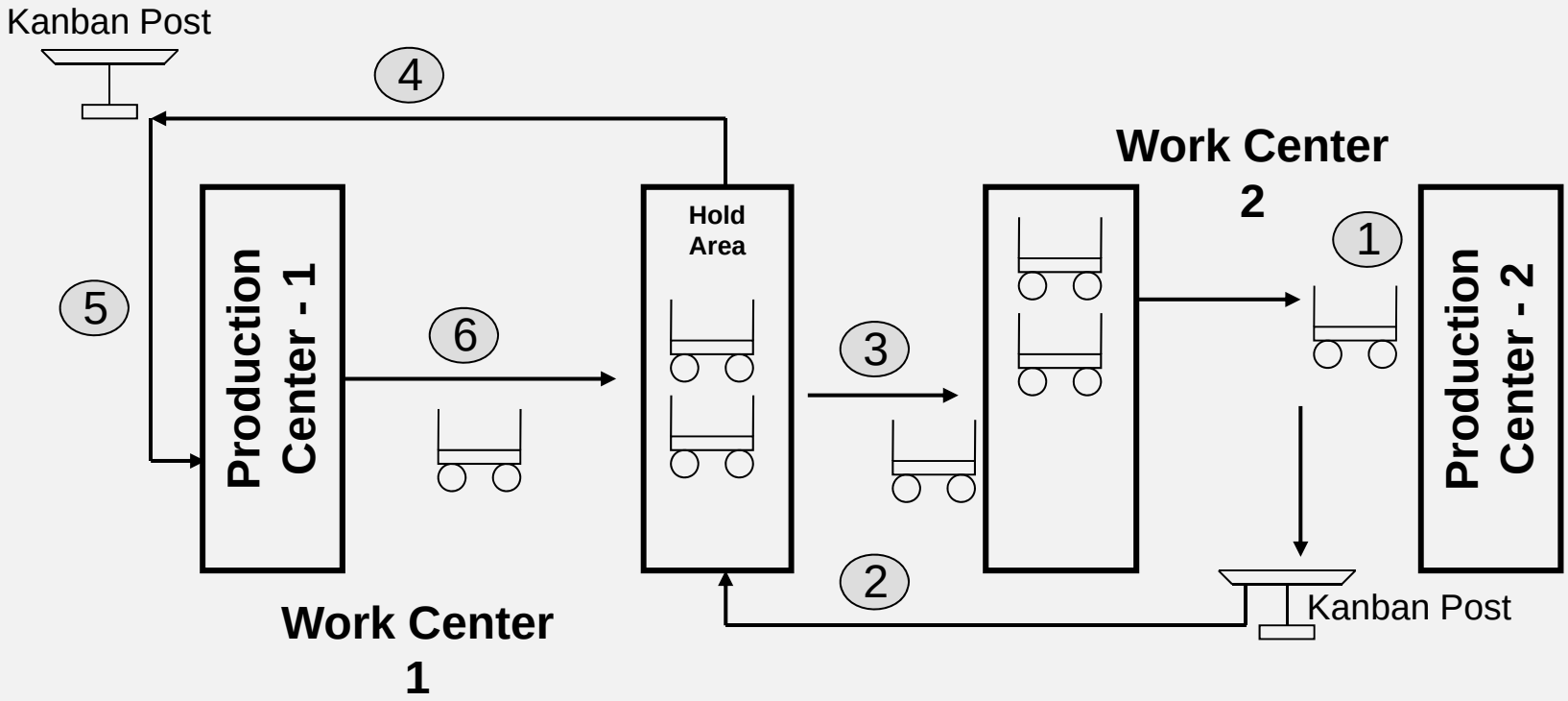
- Only required material moves to the shop floor—resulting in no unnecessary inventory or waste
- Production control reports are no longer needed
- Production and movement of goods is triggered by a visible signal, such as a kanban card, empty container, empty designated floor space, electronic signal or other indicator



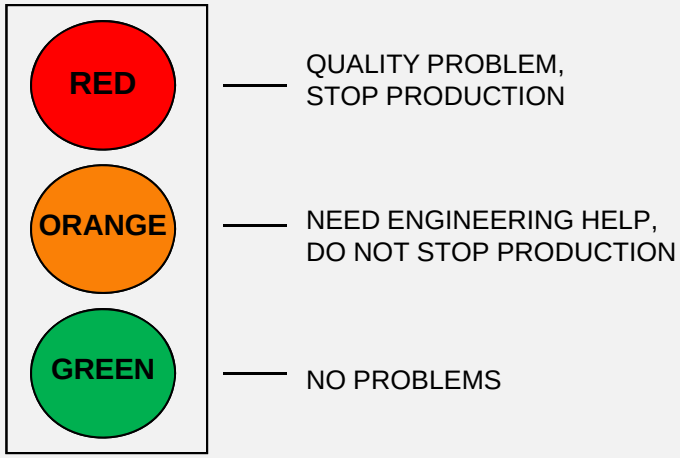
Kanban Card System Guidelines

- One card (production or conveyance) represents a standard container and set quantity
- Remove move cards as parts are taken from one work center to another
- Return move card to supplying center as authorization to move another standard container of the same part
- Place container(s) with completed parts in an accessible area. This container(s) has a production card until a move card returns from a downstream work center. Then, the production card is replaced by a move card.
- The production card removed from the container serves as an authorization to build additional parts

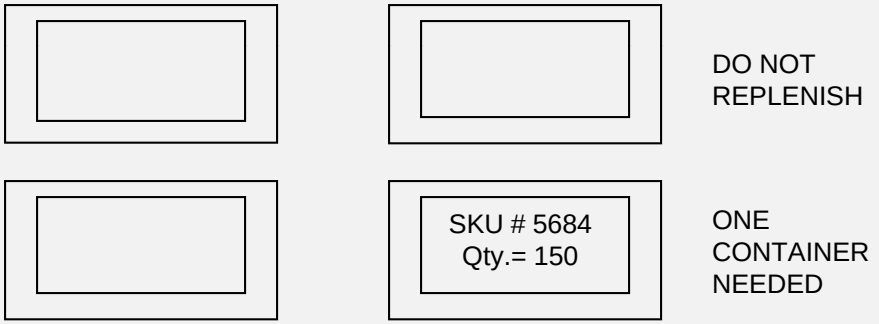
Two-Card Kanban System



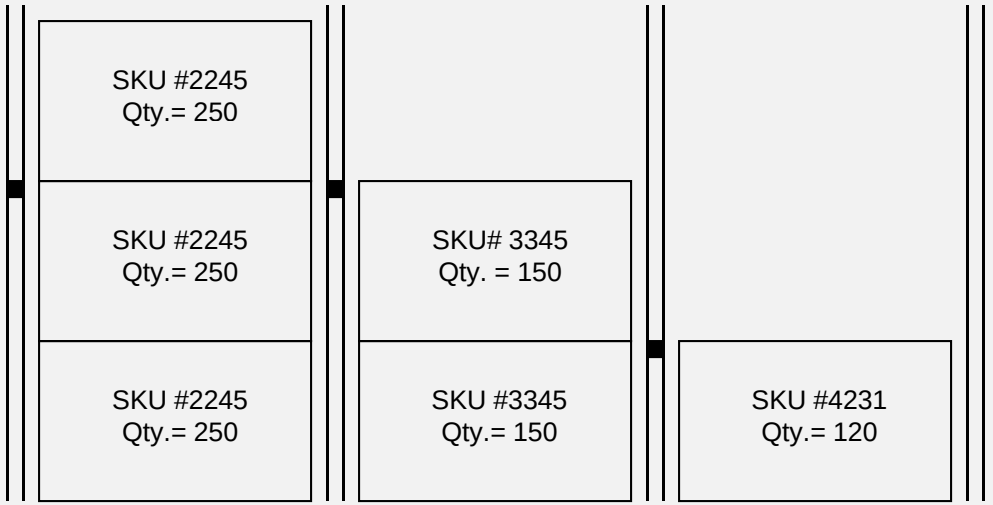
Mounted colored lights

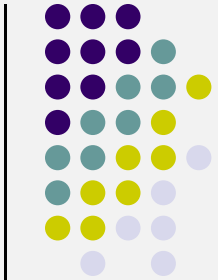


Kanban squares painted on shop floor



Marked Racks





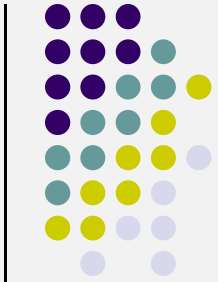
Elements of Lean Operations

- **Other nonverbal signals: Andon**

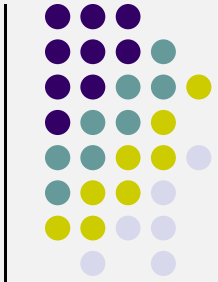
In Lean, *andon* refers to a signal used to call for help when an abnormal condition is recognized, or that some sort of action is required. The most common *andon* lights you will see are those used to request assistance on an assembly line. In the office, an *andon* will announce that a piece of equipment, like a fax machine, is having problems.

Andon comes from an old Japanese word for paper lantern. An everyday example of an *andon* is the warning light on your car's dashboard that indicates when the gas tank is getting close to empty.

Source: http://www.velaction.com/lean-andon/



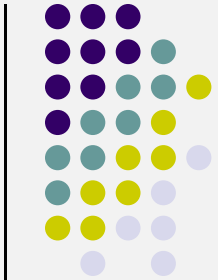
Lean Distribution



Creating a Lean Supply Chain

Modules

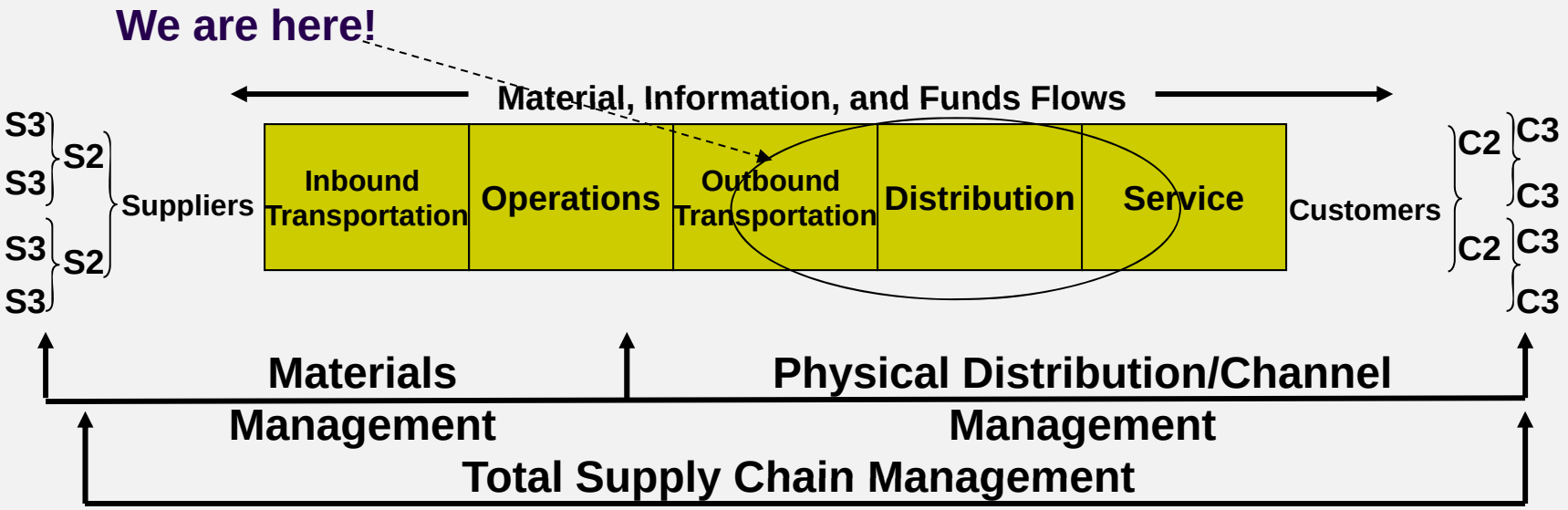
- Part I: Lean Overview
- Part II: Lean Supply
- Part III: Lean Transportation
- Part IV: Lean Operations
- **Part V: Lean Distribution**
- Part VI: Lean Measurement and Tools

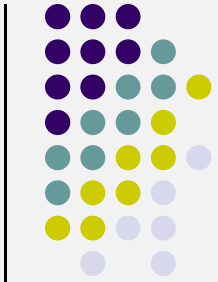


Lean Distribution Agenda

- Provide an overview to distribution channels and centers
- Understand the differences between warehouses and distribution facilities
- Understand how firms use distribution strategies to mange working capital from a financial perspective
- Identify ways to drive waste from distribution

Lean Distribution

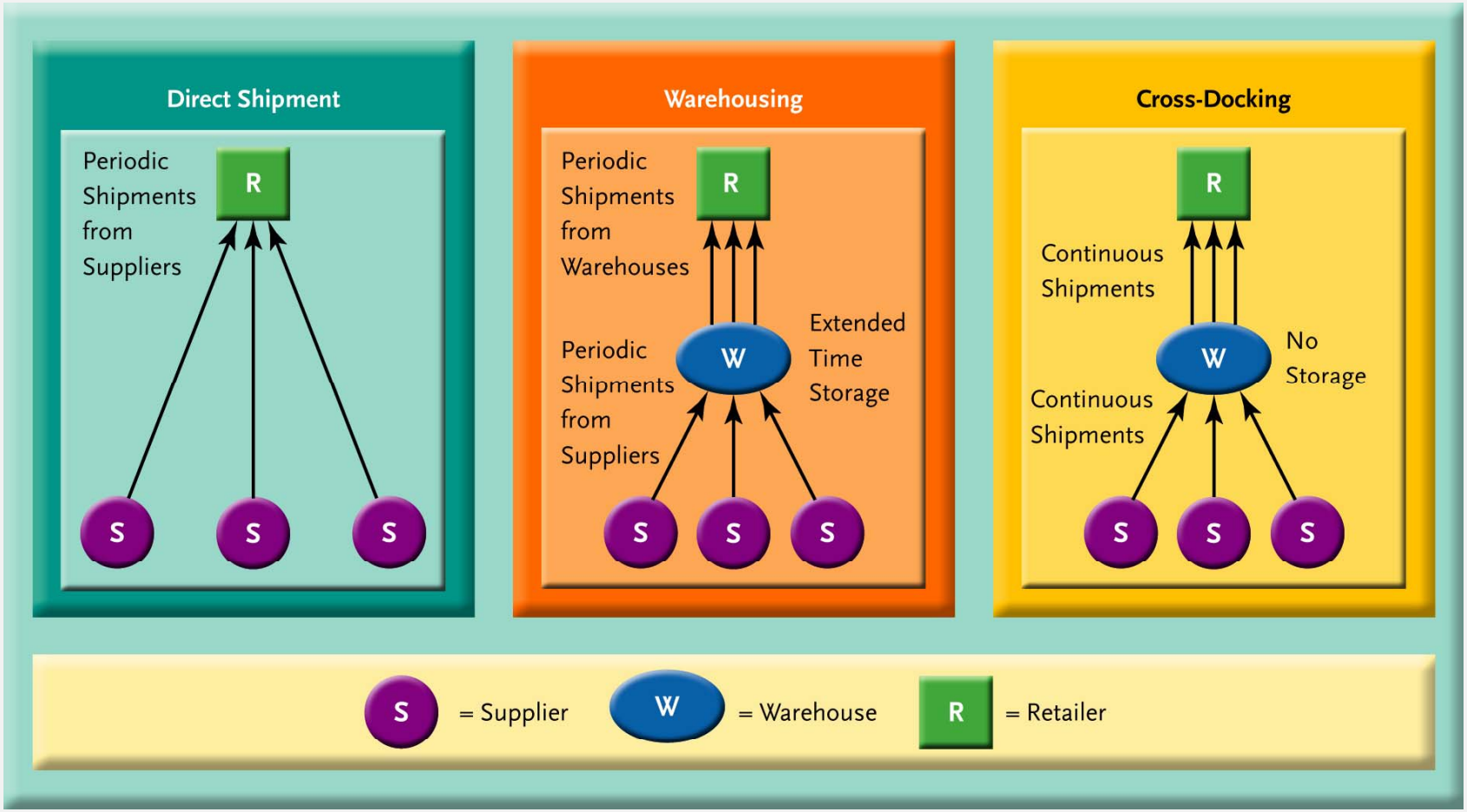




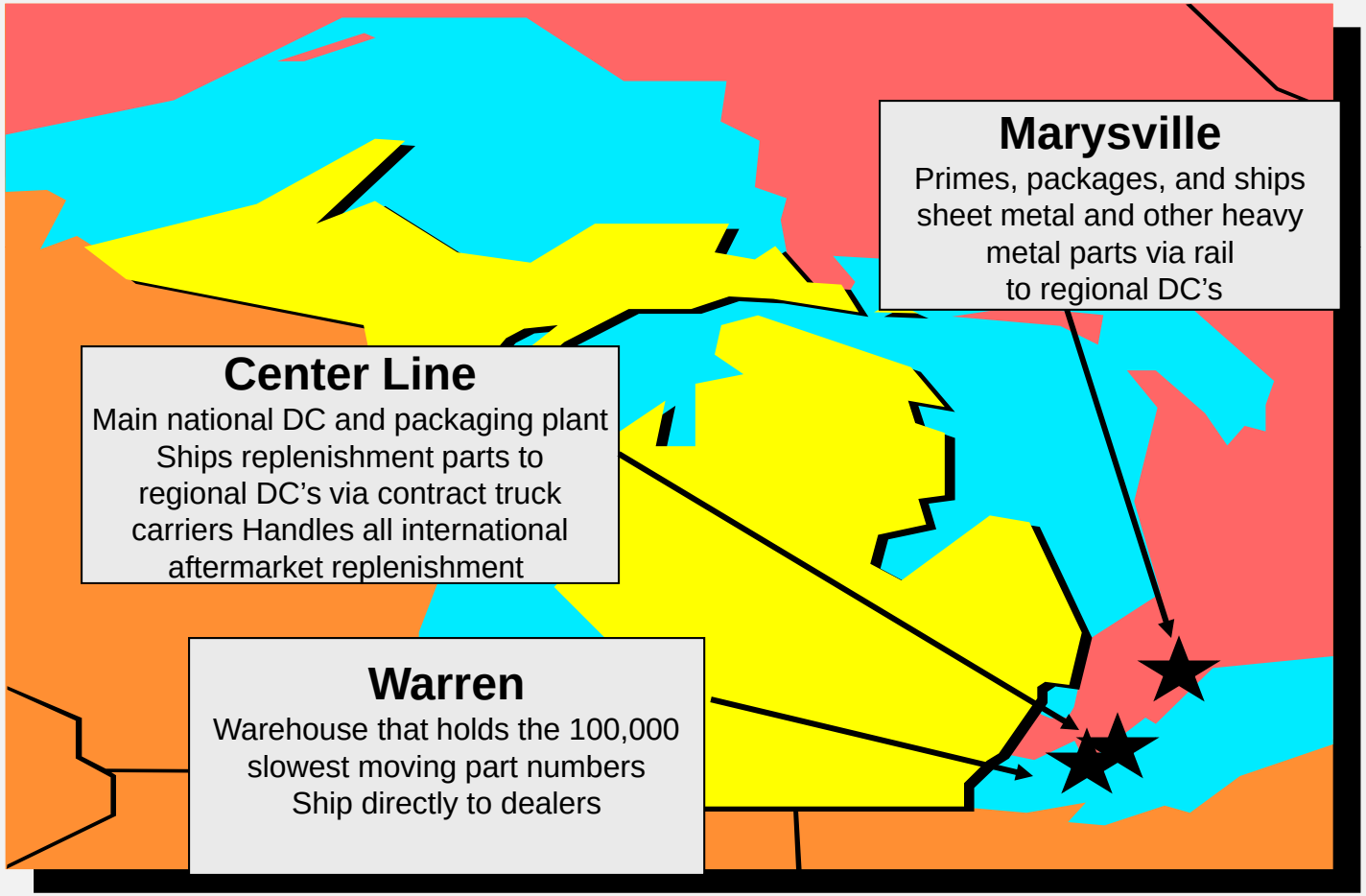
Lean Distribution

- Let's identify ways to drive waste from distribution channels
  - Use information technology (WMS, TMS, YMS, DRP)
  - Replace transportation with material handling
  - Strive for perfect record integrity (ROH=POH)
  - Improve demand estimation capabilities
  - Make-to-order production strategy
  - Optimize delivery networks
  - Strategically position cross-dock facilities
  - Optimize distribution channel design
  - Postponement
  - Facility designs that support lean objectives

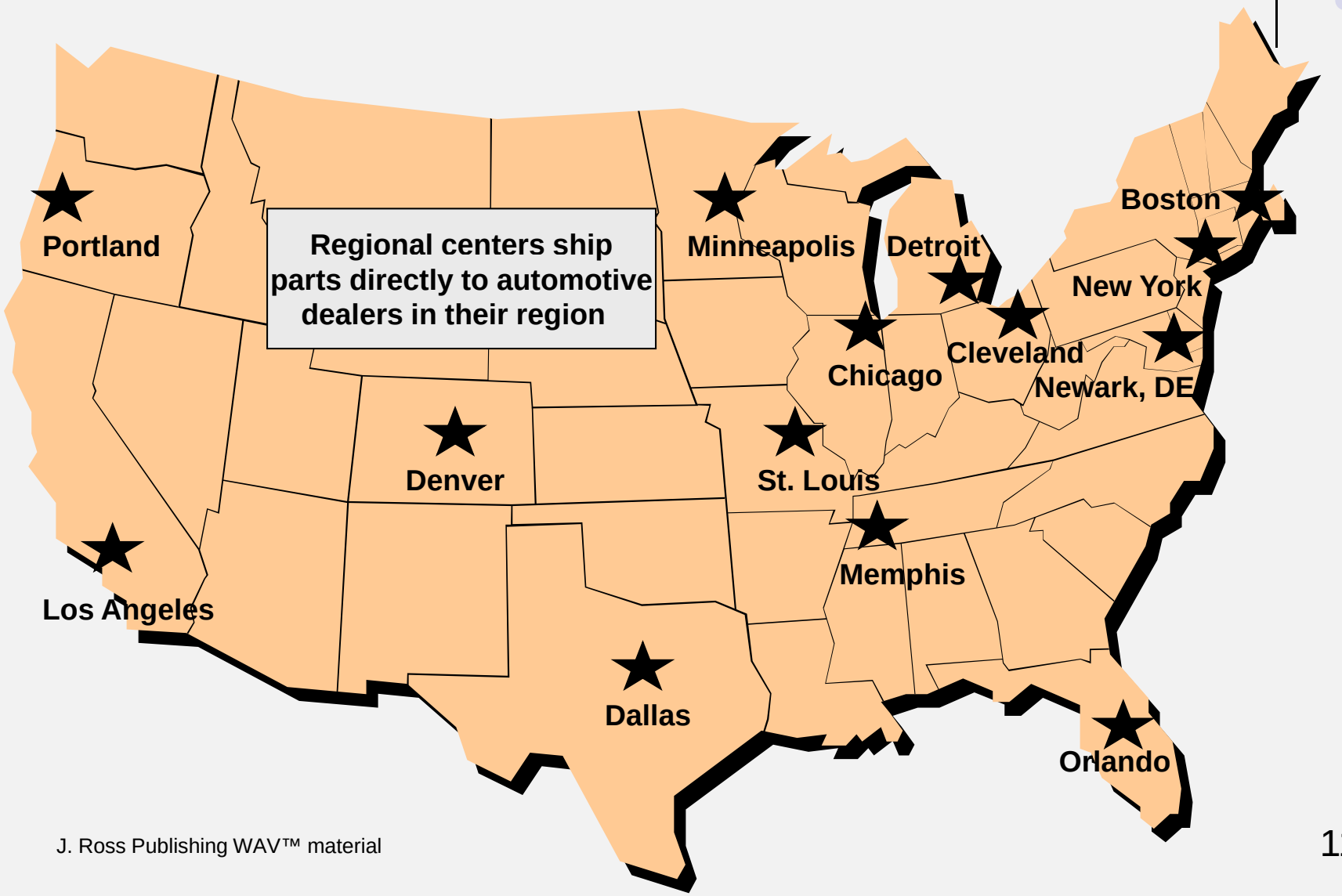
Different Channel Strategies

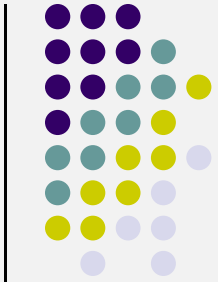


Chrysler Aftermarket Distribution Network—National DC's



Chrysler Aftermarket Distribution Network—Regional DC's (called Parts Depots)

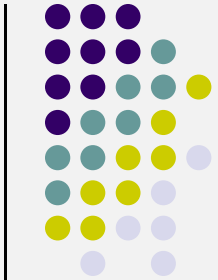




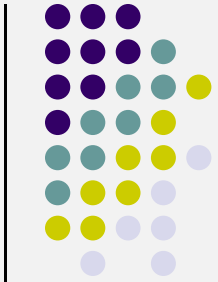
Why Have Warehouses and DC's Today?

- Provide local inventory to a customer
- Operate near vital suppliers, serving as an inbound material control center
- Consolidate outbound orders for economical transportation
- Handle reverse logistics
- Serve as a cross-docking, flow through facility
- Serve as a break-bulk facility
- Provide seasonal storage or stockpiling
- Perform value-added services

Managing Operational Working Capital



	Raw and Direct Materials	←	Receive materials from suppliers on a **just-in-time** basis
+	**Work-in-Process**	←	Use **efficient layout** and **work cells** in a **make-to-order** environment to keep WIP to a minimum
+	**Finished Goods**	←	**Bypass storage** and ship finished goods directly to customers
+	**Accounts Receivable**	←	**Receive payment quickly** for products before paying suppliers for materials
-	**Accounts Payable**	←	**Stretch payment terms** with suppliers to 30-90 days
=	**Operational Working Capital**		



Lean Distribution

- Is there a difference between warehouses and distribution centers?
- Are the differences meaningful when pursuing a lean supply chain?

Differences between Warehouses and DC's

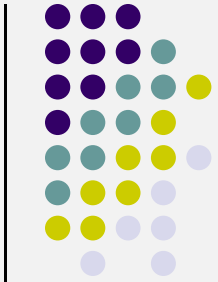
Distribution Centers…

- Hold minimum inventories and predominantly high demand items
- Handle most product in two cycles (receive and ship)
- Perform a high percentage of value adding
- Collect data in real time
- Focus on maximizing the profit impact of meeting customer delivery requirements
- Often link directly to retail outlets

Differences between Warehouses and DC's

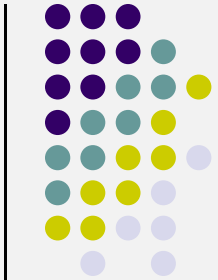
Warehouses…

- Store all products
- Handles most products in four cycles (receive, store, pick, and ship)
- Perform a minimum of value-added services
- Collect data in batches
- Focus on minimizing operating costs



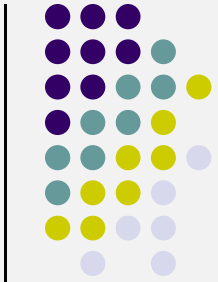
Lean Distribution

- What are some value-adding services a distribution center could provide?



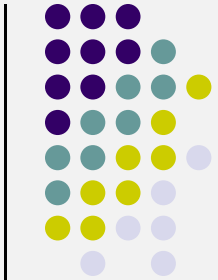
Examples of Value-Added Services

- Package / label / ticket
- Assemble kits
- Add product enhancements
- Manage returnable containers
- Cross-dock goods
- RFID tag application

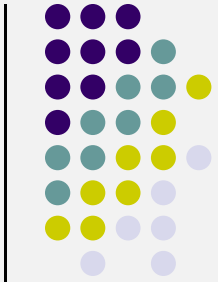


Examples of Value-Added Services

- Repair and refurbish
- Process customer returns
- Fulfill customer orders
- Manage reverse logistics
- Sequence deliveries in a JIT system
- Postponement



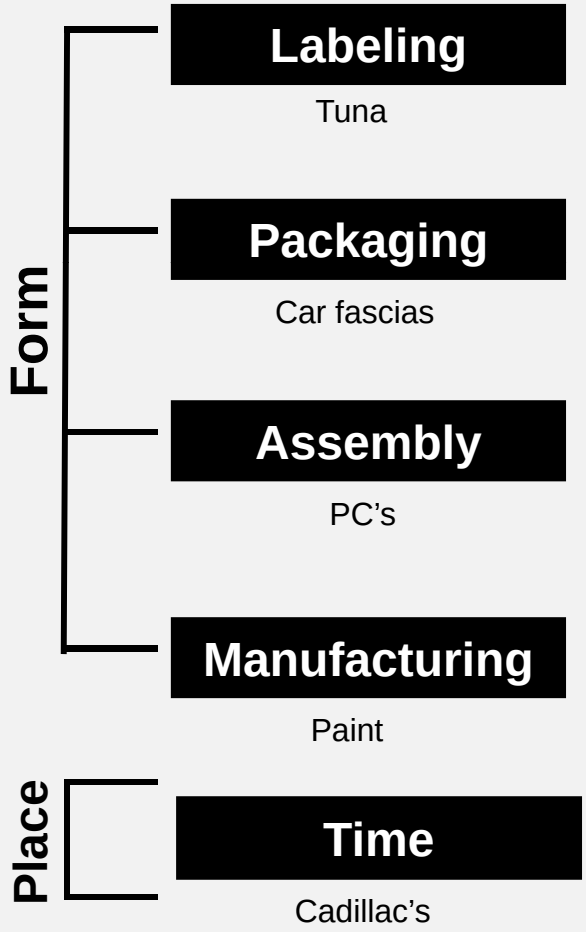
The overall trend for many companies is to reduce the number of distribution centers they maintain….Why?



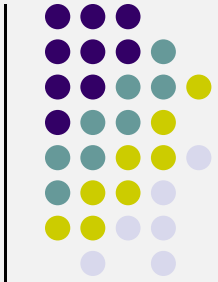
Postponement

- The principle behind postponement is the time of shipment and the location of final product processing in the distribution of a product should be delayed until a customer order is received
- The objective is to avoid shipping goods in anticipation of when demand will occur (time postponement) or to avoid creating the form of the final product in anticipation of that form (form postponement)
- Postponement can help manage risk, uncertainty, and finished goods inventory
- We all understand the concept of form postponement—think of paint at the retail store!

Five Types of Postponement

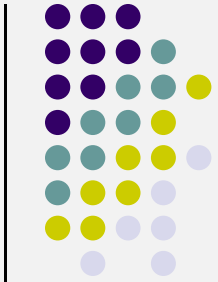


Adapted from Winn and Bowersox

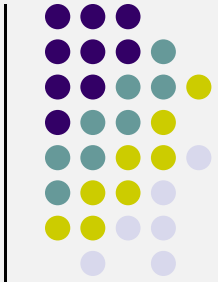


DC Layout and Design Principles

- One-story best for distribution
- Straight-line flow whenever possible
- Use efficient material handling equipment
- Utilize building height whenever possible
- Keep aisle space to a minimum
- Receiving doors near usage location
- Item-location strategies
  - Place fast movers near shipping dock
  - Use WMS, DRP, YMS



Lean Measurement



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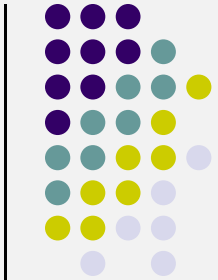
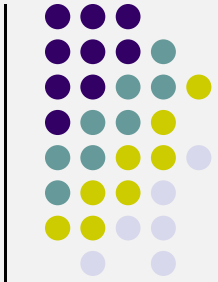


Lean Measurement and Tools

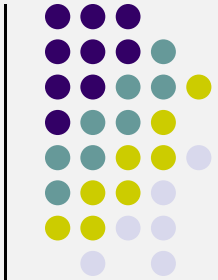
- Appreciate how measurement can support or conflict with lean objectives
- Identify the corporate impact of lean from a financial perspective
- Identify a robust set of tools and techniques that support lean objectives



Why Measure Performance?

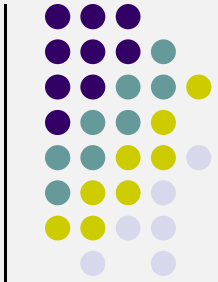
General Problems with Most Measurement Systems

- Too much data
- Short-term focus without a picture to the longer-term
- Lack of detail
- Drive the wrong behavior
- Emphasize behavior versus accomplishment
- Encourage competition and discourage teamwork
- Measures all suppliers the same way
- Not timely



Characteristics of Effective Measures

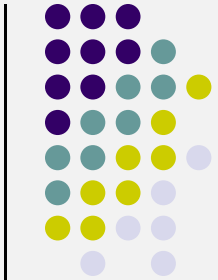
Characteristic:	Yes	No
Measures use data from sources visible throughout the organization		
Performance objectives are reviewed regularly and adjusted as required		
Measurement targets are based on world-class performance, ideally through performance benchmarking		
Performance measures link to and support corporate strategies and objectives		
Performance measures link to and support performance strategies and objectives of other functional groups		
Individuals or groups are held accountable for achieving performance measures		
Measures do not encourage unintended consequences or behavior		
Measures promote teamwork, continuous improvement, and cross-functional cooperation		
Key performance results are reported to executive leaders		
Performance measures focus primarily on accomplishments rather than activities		
Performance measures include well-defined action plans regarding how to achieve each measure		



Examples of Poor Measurement

A company that measures output when evaluating the performance of its plants should not have been surprised when managers scheduled massive overtime in late December to make year-end production targets. The result was some serious overtime costs and production that had no corresponding demand. This excess inventory was stored in leased trailers outside the plant. Most employees were assigned to painting or other housekeeping duties in January due to a surplus of supply.

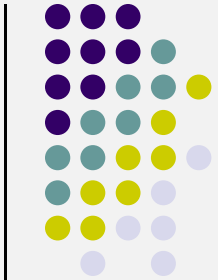
What waste or problems are being created here?



Examples of Poor Measurement

A company implemented a new scheduling system that featured packaging smaller quantities of more part numbers rather than packaging larger quantities of fewer part numbers. This system would help ensure that only quantities that were needed by downstream entities would be packaged. Unfortunately, the company did not change its measurement system, which still based rewards on the number of pieces packaged per hour, a measure that additional changeovers adversely affect. Work centers ignored the scheduling system and continued to package unnecessary goods in order to gain efficiencies from higher volume runs and fewer changeovers.

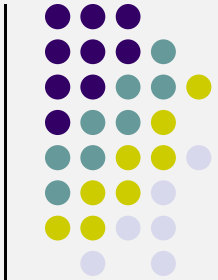
What waste or problems are being created here?



Examples of Poor Measurement

A major computer company measured its customer service people on how quickly they resolved customer problems. In this case the metric that was used focused on how quickly a service call lasted. The behavior that resulted because of this measure infuriated customers. Customer service representatives would simply transfer a customer's call to another representative or department, quickly disposing of "the problem" and looking good on the call duration measure. Some customers were transferred seven or more times during their service call.

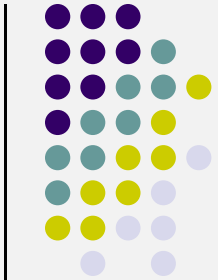
What waste or problems are being created here?



Examples of Poor Measurement

An OEM that operates a network of aftermarket distribution centers measures the percent of customer orders that are shipped within their designated shipping time. Operations personnel quickly realized that a call to the manager that compiled this metric would result in an adjustment to show that any late orders were shipped on time. It should come as no surprise that the distribution centers across this company rarely achieved anything less than 100 percent on-time shipping compliance, at least on paper.

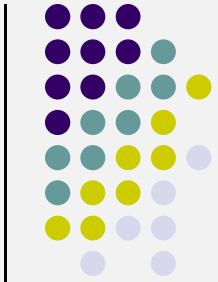
What waste or problems are being created here?



Examples of Poor Measurement

A plant manager failed to process customer returns at his facility because returns generated minimal credit to his operating budget. Budget numbers were earned for shipping orders out, not bringing them back. Not only did unprocessed returns stack up to the point they affected the flow of the facility, customers complained to corporate headquarters that they were not receiving their return credits. The plant manager, who on paper looked favorable on his operating numbers, was eventually reassigned to other duties.

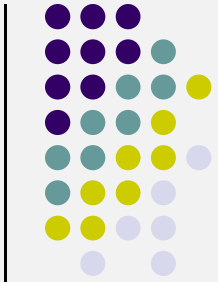
What waste or problems are being created here?



Identifying the Corporate Impact of Lean

	Before:	After:
Sales ($millions)	**$2,300**	**$2,300**
Net Profit	**$184 (8% profit margin)**	**$184**
Assets		
Cash	**$220**	**$220**
Securities	**$85**	**$85**
Receivables	**$275**	**$275**
Inventories	**$287.5 (8 turns)**	**$209.1 (11 turns)**
Plant and Equipment	**$450**	**$450**
Total Assets	**$1,317.5**	**$1,239**

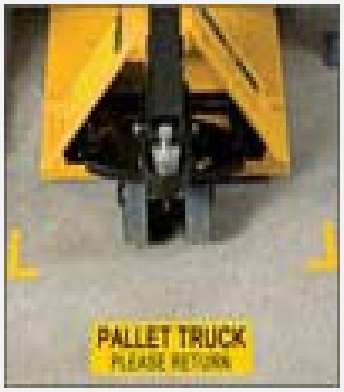
Inventory Turnover = Sales/Inventory ($2,300/$287.5) = 8 turns annually, ($2,300/$209.1) = 11 turns annually
Asset Turnover = Sales/Total Assets ($2,300/$1,317.5) = 1.75, ($2,300/$1,239) = 1.86
Return on Assets = Profit Margin x Asset Turnover = (8% x 1.75) = 14%, (8% x 1.86) = 14.9%
Asset to Sales Ratio = ($1,317.5/$2,300) = .57, ($1,239/$2,300) = .54

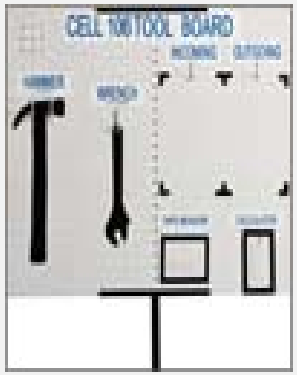


Tools to Support Lean Improvements

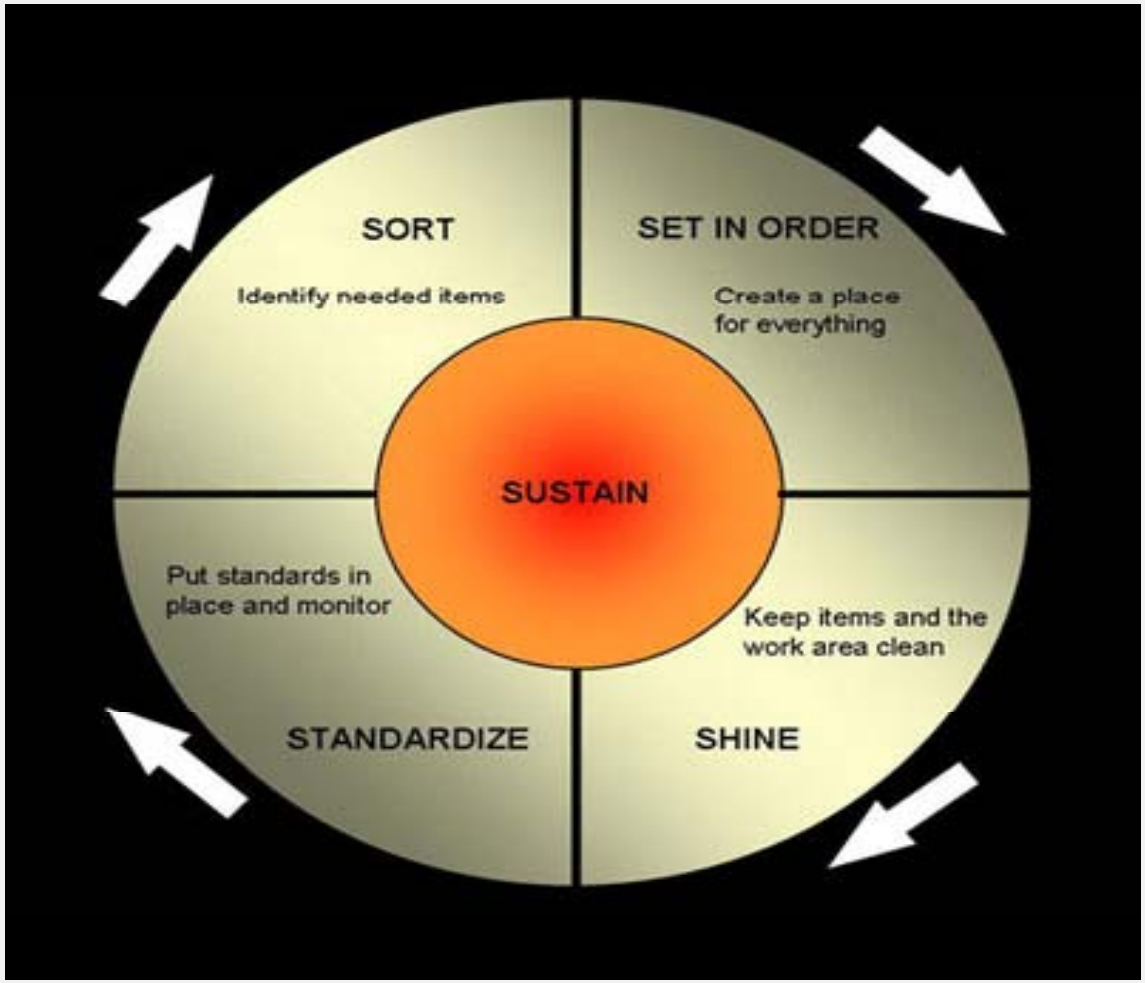
5S

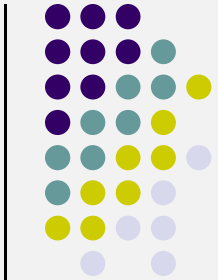
5S is a Japanese lean methodology designed to reduce waste and optimize productivity through better workplace organization. The 5 pillars of the 5S system are **Sort** (Seiri), **Set in Order** (Seiton), **Shine** (Seiso), **Standardize** (Seiketsu), and **Sustain** (Shitsuke).





5S


SORT
Identify needed items
SET IN ORDER
Create a place for everything
SUSTAIN
Put standards in place and monitor
Keep items and the work area clean
STANDARDIZE
SHINE



Defining the 5S

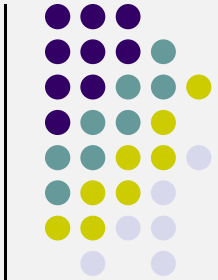
Seiri (整理) Tidiness, Organization (Clearout and Classify)

Seiton (整頓) Orderliness (Configure)

Seiso (清掃) Cleanliness (Clean and Check)

Seiketsu (清潔) Standards (Conformity)

Shitsuke (躾) Discipline (Custom and Practice)

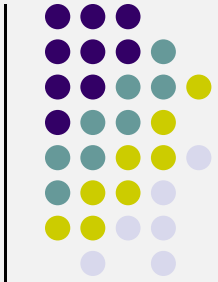


Creative Thinking

THE RULES

- ***Withhold Judgment***
- ***Strive for Many Ideas***
- ***Do Not Reject Ideas***
- ***Make the Group Stretch***
- ***Remove Distractions and Allocate Enough Time***
- ***Seek Combinations of Ideas***
- ***Do Not Attach Names to Ideas***

Creative thinking is also called divergent thinking; Critical thinking is also called convergent thinking

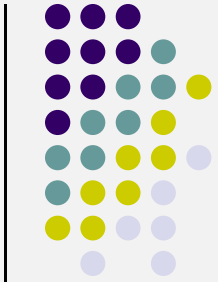


Critical Thinking

THE RULES

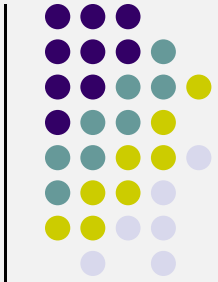
- ***Avoid Early Closure***
- ***Be Analytic***
- ***Do Not Ignore Difficult Issues***
- ***Stress Objectivity***
- ***Remember the Implementation Plan***

Creative thinking is also called divergent thinking; Critical thinking is also called convergent thinking



Group Problem Solving Process Steps I-III

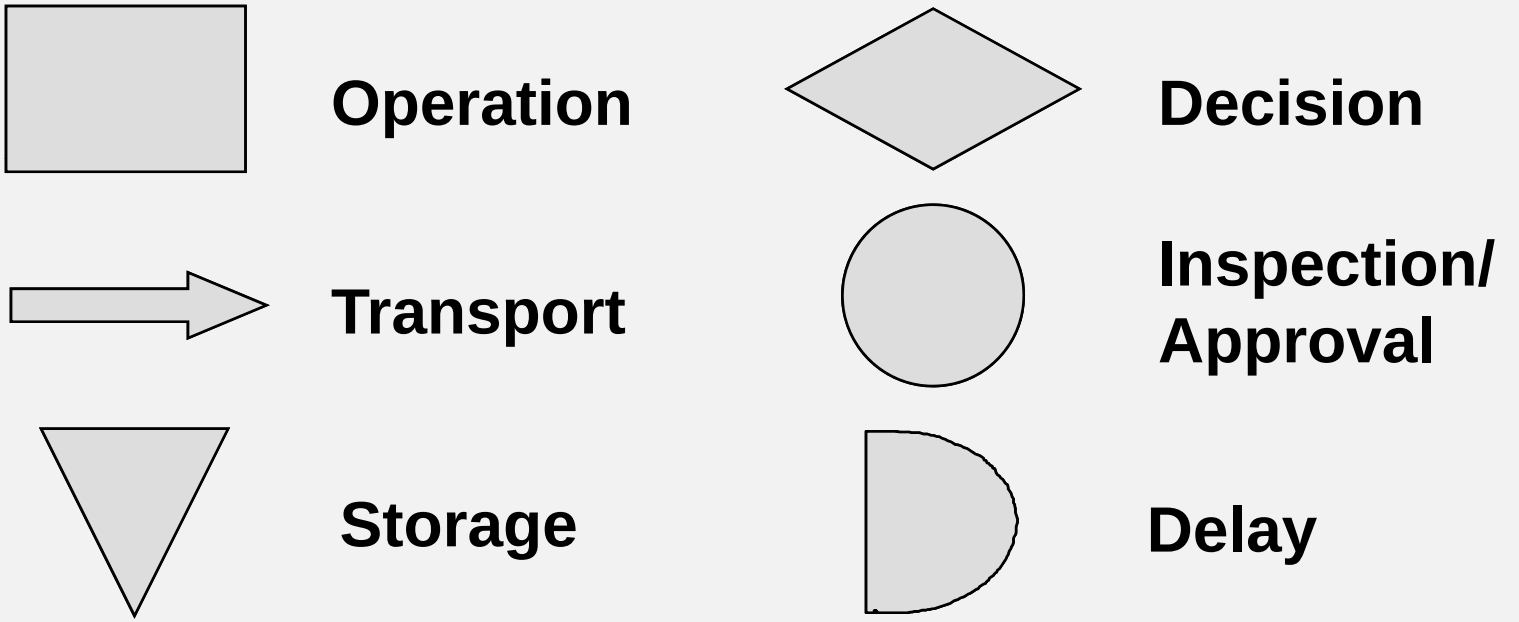
Step	Question to be Answered	Creative Thinking	Critical Thinking	Next Step Requirements
I. Identify Problem	What needs to be changed?	Consider possible problems	Agree upon a specific problem	Describe desired state in observable terms
II. Analyze Problem	What's preventing us from reaching the desired state?	Identify possible causes	Identify and validate key causes(s)	Document and rank key causes
III. Generate Possible Solutions	How could we make the change?	Develop ideas on how to solve the problem	Identify most likely solutions	Create a defined solution(s) list



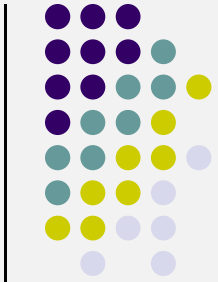
Group Problem Solving Process
Steps IV-VI

Step	Question to be Answered	Creative Thinking	Critical Thinking	Next Step Requirements
IV. Select and Plan the Solution	What is the best way to correct the problem?	Evaluate potential solution(s) using various criteria Generate ideas on how to implement the solution	Agree upon solution(s) Agree upon implementation and evaluation plans	A plan for making and monitoring the Change Measurement criteria to evaluate solution effectiveness
V. Implement Solution	Are we following the plan?		Agree upon contingency plans (if necessary)	Solution(s) are in place
VI. Evaluate Solution	How well did it work?	Identify and share lessons learned	Agree upon the effectiveness of the solution Identify any continuing problems	Verify the problem is solved. If not , recycle to Step II

Standard ANSI Process Flow Chart Symbols

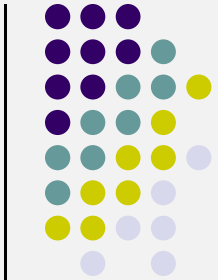


ANSI: American National Standards Institute



Value Stream Mapping

- VSM is a tool that helps visualize the flow of material and information as a product or service progresses through a value stream
- VSM is known as material and information flow mapping

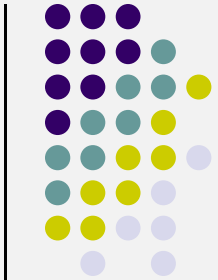


VSM—Key Concepts

Value Stream—all the interrelated activities, value-added and other, needed to make a complete material or information product. James Womack and Daniel Jones argue that a value stream is the set of all the specific actions required to bring a product through the three critical elements of any business—product design, information management, and physical transformation

Value Stream Map—a set of drawings that make the flow of material and information visible

Value Stream Mapping—the physical effort that creates value stream maps



VSM—Key Concepts

Current State Map—an illustration of a process or value stream as it currently appears

Future State Map—an illustration of a process or value stream that represents an ideal state after applying Lean principles

Current State Value Stream Mapping Icons

Customer/supplier icon represents starting and end points.

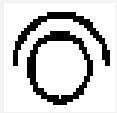
A data box represents a process, operation, or machine and details the steps in the part of process where it is positioned.

Represents pushing material from one area to the next.

Kaizen burst identifies improvement needs and helps plan Kaizen workshops.

A general box that is used for additional information.

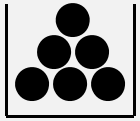
Illustrates inventory before and between work areas or processes.



The operator icon shows the number of workers in an area.

Represents the movement of material into and out of a facility.

Shipments into and out of a facility.



Represents the storage of raw information or material before a process.

The timeline shows value added times and non-value added (wait) times.

Represents electronic flows such as EDI, the Internet, Intranets, and local area networks.

Future State Value Stream Mapping Icons

A location where kanban signals reside for pickup. It is also a point to exchange production and withdrawal cards.

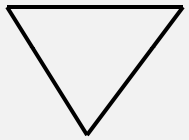
Represents an inventory “supermarket” where small amounts of inventory are available to support downstream operations.

Represents temporary safety stock to protect against uncertainties such as demand changes or machine downtime.

This indicates the physical pulling of material or information from an upstream work center to a downstream work center.

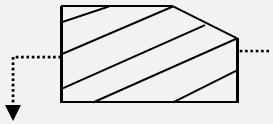
Represents a pull system that gives instruction to subassembly processes to produce a predetermined type and quantity of product.

The level load icon is used to reorder kanbans to level the production volume and mix over a period of time.

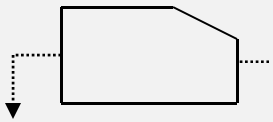


Used to signal the production of a predetermined batch whenever the inventory level in the supermarket between two processes drops to a trigger or minimum point.

Conveys a process standard to use the oldest inventory first.



Represents a kanban that instructs a material handler to retrieve parts from a supermarket to support a downstream work center.



Represents a kanban that triggers production of a pre-determined number of parts.

The Benchmarking Process

Lean supply, transportation, operations, or distribution

Set baseline performance metrics

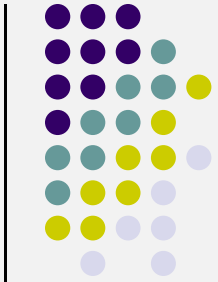
Competitors versus non-competitors

Questionnaires, interview guides

Direct site visits, interviews, use of third-party and secondary information and data

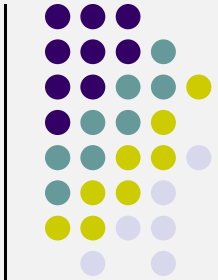
Summarize findings and develop action plans

Make changes and compare results against the baseline performance and targets. Recycle to the first step



Kaizen Events or Workshops

- In Japanese, the word *kai* means continuous and *zen* means improvement, or continuous improvement
- Another interpretation views *kai* to mean change and *zen* to mean good, or change for the better
- *Kaikaku* is a rapid or revolutionary event rather than an incremental event



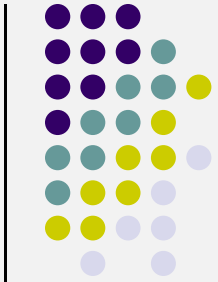
Kaizen Events

Day 1—Focus the Kaizen Event

- Build a description if the target work process
- Walk through the target work process
- Build the mission statement
- Set goals for the kaizen event
- Define the do's and don't's
- Close Day 1

Day 2—Evaluate the Target Work Process

- Gather information
- Analyze the amounts and sources of waste
- Summarize the results of the evaluation
- Close Day 2



Kaizen Events

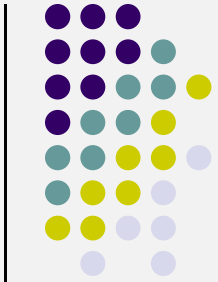
Day 3—Solve the Perfo5mance Issues

- Generate improvement ideas
- Trim improvement ideas
- Conduct an experiment
- Select improvement ideas
- Close Day 3

Days 4 and 5—Act to Improve the Target Work Process

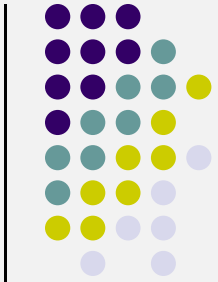
- Create action plans
- Execute improvement ideas
- Measure results

Source: Vitalo, Butz, and Vitalo, “Kaizen Desk Reference Standard.”



Value Analysis

- What is value analysis?
  - *The organized and systematic study of every element of cost in a part, material, process, or service to make certain it fulfills its function for the customer at the lowest total cost. It employs techniques which identify the functionality the user wants from the part, material, process or service*
  - Value = Function/Cost
  - Function is what a part, material, process, or service does (noun and a verb)

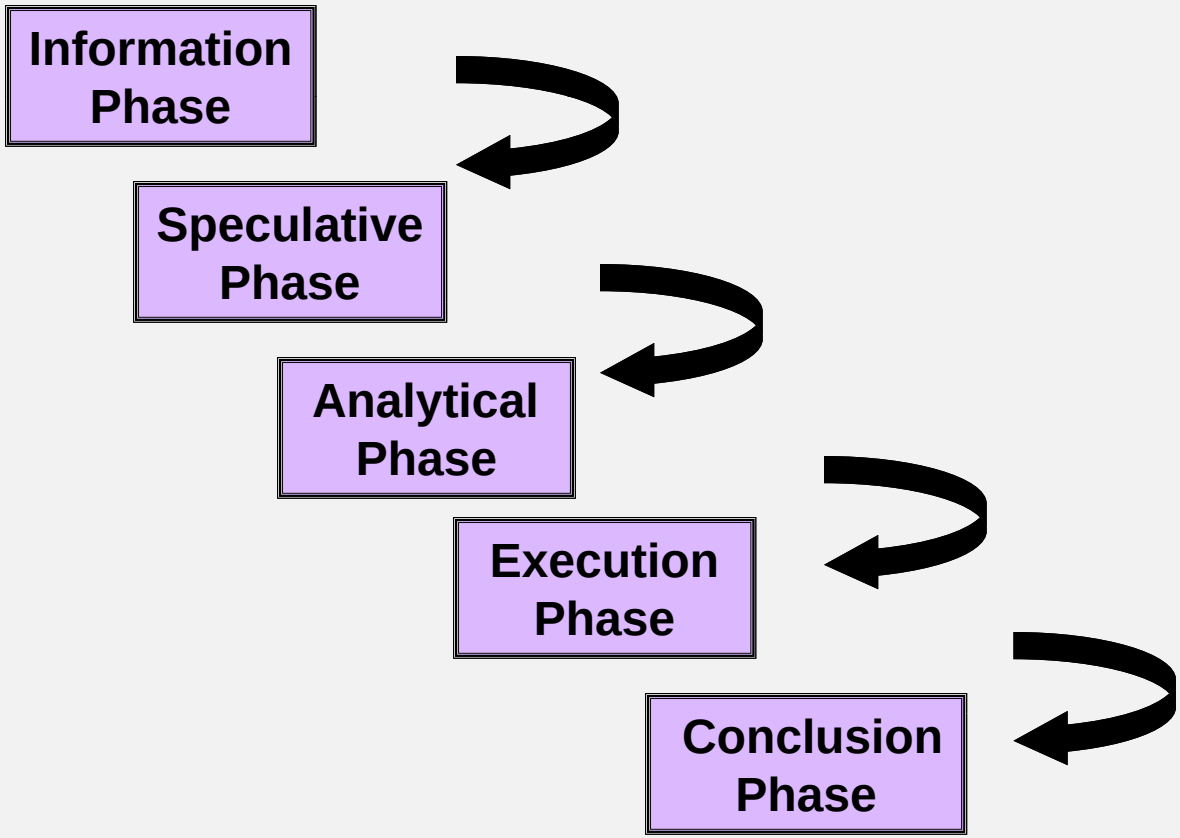


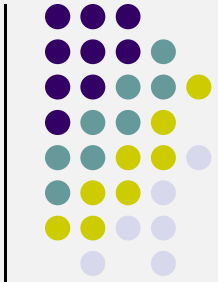
Value Analysis

- What is value analysis?
  - VA is a continuous improvement technique—it is not product or service cheapening!!
  - VA workshops and the VA process are a combination of group problem solving, project management, process redesign, and continuous improvement efforts
  - Applies to manufacturing and non manufacturing organizations
  - *Value analysis requires inter and intra organizational integration!!*

Value Analysis

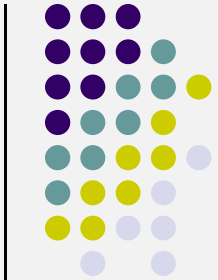
Value Analysis Workshop Steps





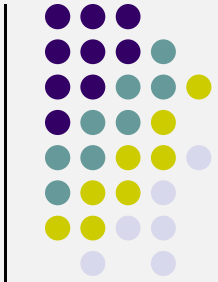
Value Analysis

- **Information Phase**
  - Primary focus: Identify existing parts, materials, processes, or services to study
    - Large total dollars/high unit cost (20/80 rule)
    - Known problems
    - Complex in design or scope



Value Analysis

- **Information Phase** (continued)
  - Primary focus: Identify existing parts, materials, processes, or services to study
    - Outdated design
    - No longer competitive/does not satisfy customer needs
    - Overly customized
    - Involves many operations
    - Excessive movement or handling
    - Long lead times



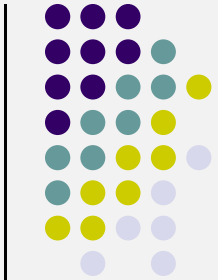
Value Analysis

- **Information Phase** (continued)
  - Put together the right VA group
  - Gather data
  - Establish preliminary improvement targets
  - Identify the function of the part, material, process, or service under study
    - Primary function
    - Any secondary functions

Value Analysis

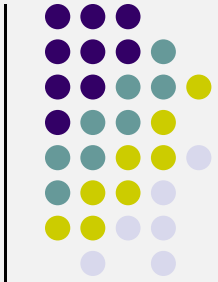
- **Speculative Phase**
  - "What if" thinking in a search for what will meet our requirements
  - Brainstorming / wide open thinking are critical
  - Ask the right questions for determining value in a product or service—

Eureka!!



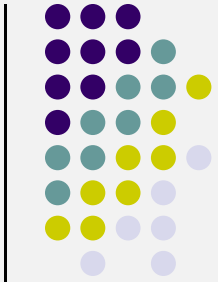
Value Analysis

- **Speculative Phase** (continued)
  - Questions for determining value in a part, material, process, or service--
    - *Does its use contribute value to our customers (internal or external)?*
    - *Is its cost proportionate to its usefulness?*
    - *Does it need all its features, parts, packaging, or steps?*
    - *Is there anything better available for the intended use?*



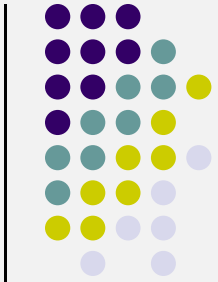
Value Analysis

- **Speculative Phase** (continued)
  - Questions for determining value in a part, material, process, or service--
    - *Can it be produced by a lower total cost method?*
    - *Can a standard application be found that accomplishes the function at a lower total cost?*
    - *Do material, labor, overhead, and reasonable profit equal its cost?*



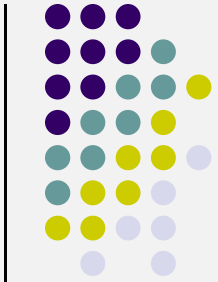
Value Analysis

- **Speculative Phase** (continued)
  - Questions for determining value in a part, material, process, or service--
    - *Can another dependable supplier provide it for less?*
    - *Is anyone buying it for less?*
    - *What affect will any changes have on our customers?*
    - *Does it have other functionality to the customer?*



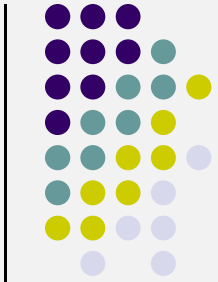
Value Analysis

- **Analytic Phase**
  - Perform cost/benefit analysis on each idea
  - Assess affect on internal and external customers
  - Assess the reality of any changes
  - Review improvement targets



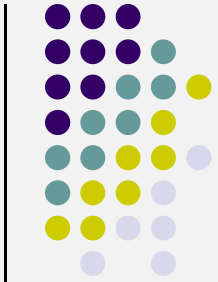
Value Analysis

- **Execution Phase**
  - VA group/team approach should foster buy-in
  - Develop implementation plan
    - Break down changes across functional areas
  - Execute changes
  - Note time of changes to assess effect



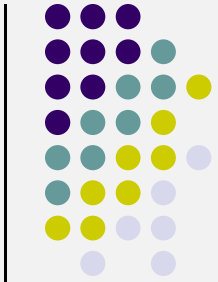
Value Analysis

- **Conclusion Phase**
  - Verify the success of changes
  - Document and report savings!!!
  - Put all files back in order
  - Disband or assume a new VA challenge
    - Standing VA workshops versus ad hoc efforts
  - Transfer learning throughout the organization



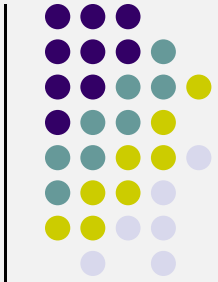
Value Analysis

- ***Keeping VA alive —***
  - Track hard results
  - Recognize and reward VA efforts across the organization
  - Lobby displays
  - Publicity and reports
  - Offer VA training to suppliers



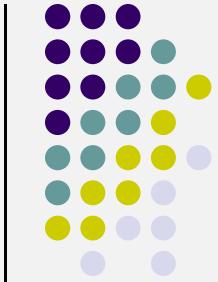
Supplier Suggestion Programs

- Most firm do NOT have a formal supplier suggestion program or system in place
- Ask where your company is creating costs and complexity for suppliers—this is a great way to identify lean improvement opportunities
- Best-practice supply organizations track the suggestions they receive from suppliers, respond to suggestions in an agreed-upon time frame, and report to executive managers any savings achieved through the system
- The suggestion system should serve as a central repository for all ideas received from suppliers



Supplier Suggestion Programs

- Developing a web-based supplier suggestion program may be one of the most cost effective ways to manage costs
- Firms that are serious about a supplier suggestion program must commit resources to evaluate the suggestions they receive, including a program manager or steering committee to oversee the process and making engineers available to evaluate the technical merits of a suggestion
- Suppliers will quickly become disinterested in any program they perceive is unresponsive to their suggestions



Thank you!!

Any questions or comments?