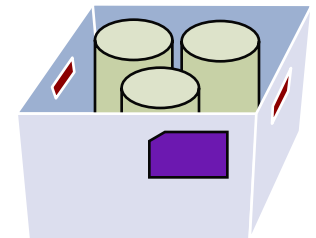
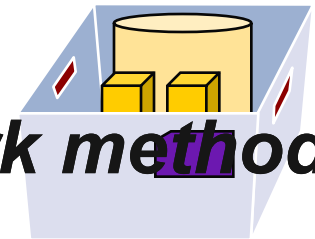
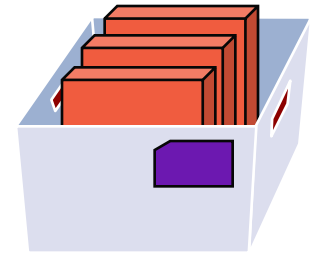


# Just-In-Time Systems

# *Characteristics of Lean Systems:*

## *Just-in-Time*

- ***Pull method of materials flow***
- ***Consistently high quality***
- ***Small lot sizes***
- ***Uniform workstation loads***
- ***Standardized components and work methods***
- ***Close supplier ties***
- ***Flexible workforce***
- ***Line flows***
- ***Automated production***
- ***Preventive maintenance***



# JIT Measurements

- Keeping work flows moving
- Eliminating inventories
- Reducing travel distances
- Eliminating defects and scrap
- Maximizing usage of space

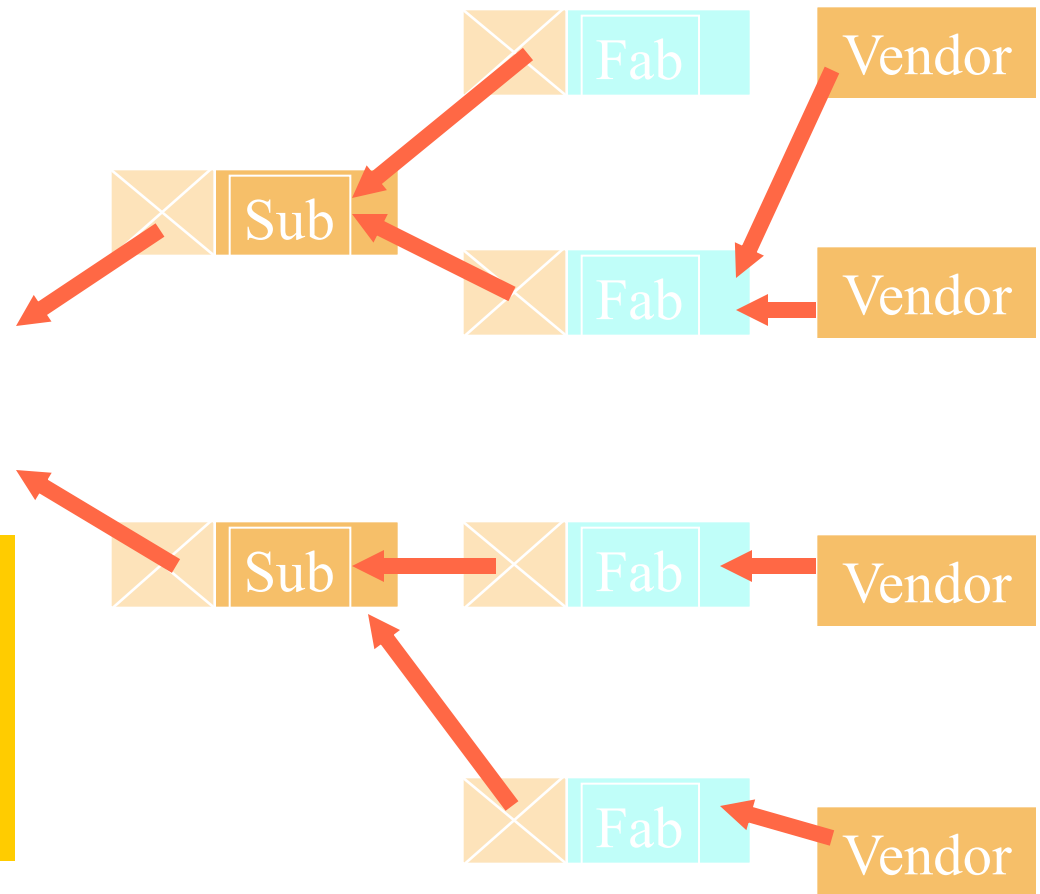
**Here the customer starts the process, pulling an inventory item from Final Assembly...**

**Then sub-assembly work is pulled forward by that demand...**

**Customers** ← **Final Assembly**

**The process continues throughout the entire production process and supply chain**

# JIT Demand-Pull Logic



# Just-In-Time Production

## WHAT IT IS

- Management philosophy
- “Pull” system through the plant

## WHAT IT DOES

- Attacks waste
- Exposes problems and bottlenecks
- Achieves streamlined production

## WHAT IT REQUIRES

- Employee participation
- Industrial engineering/basics
- Continuing improvement
- Total quality control
- Small lot sizes

## WHAT IT ASSUMES

- Stable environment

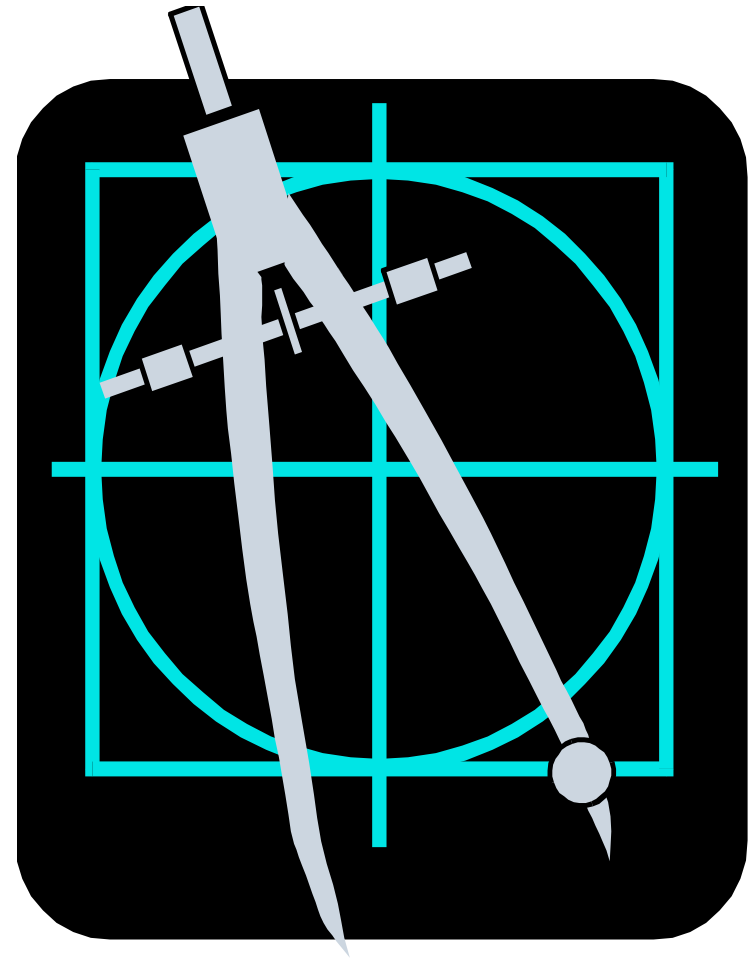
# Traditional Systems Compared to JIT

# Priorities

- Traditionally
  - Accept all customer orders
  - Provide a large number of options from which customers may order
- JIT
  - low cost/high quality within limited market

# Engineering

- Traditional
  - design custom outputs
- JIT
  - design standard outputs
  - incremental improvements
  - design for manufacturability (DFM)





# Capacity

- Traditional
  - excess capacity designed into system *just-in-case* problem arises
  - highly utilized
  - inflexible
- JIT
  - minimize waste of having extra capacity
  - flexible capacity
  - moderately utilized

# Transformation System

- Traditional
  - job shop
  - materials handling equipment
  - lots of space to store inventory
- JIT
  - mostly used in repetitive production situations
  - job shops often converted to cellular manufacturing

# Transformation System *continued*

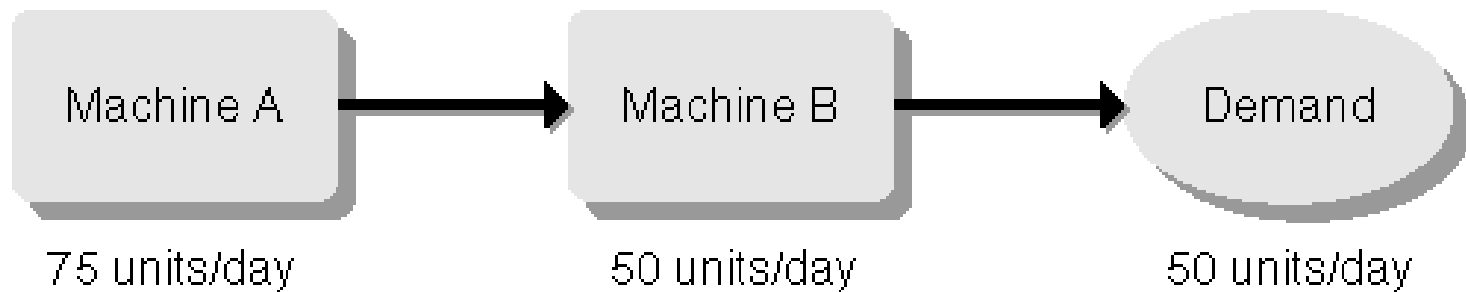
- Traditional-long lead times are often thought to allow more time to make decisions and get work performed.
- JIT
  - short lead times mean easier, more accurate forecasting and planning.
  - If lead times are reduced, there is less time for things go awry, to get lost, or to be changed
  - “Don’t let the parts touch the floor” (the parts have to be kept on the machines and thus be worked on until completed)
  - Smaller batches result in shorter lead times and less inventory, at the same time. With smaller batches, engineering changes get to the customer sooner, problems with quality are corrected more quickly, rework is reduced, there is less obsolete inventory, and new products get to market more promptly.

# Transformation System *continued*

## ■ JIT

- Employing Kanban (*Toyota's materials management system*)
- Pull system: System for moving work where a workstation pulls output from the preceding station as needed (*control-based systems that signals the requirement for parts as they are needed in reality*).
- Push system: System for moving work where output is pushed to the next station as it is completed (*planning-based systems that determine when workstations will probably need parts if everything goes according to plan*)

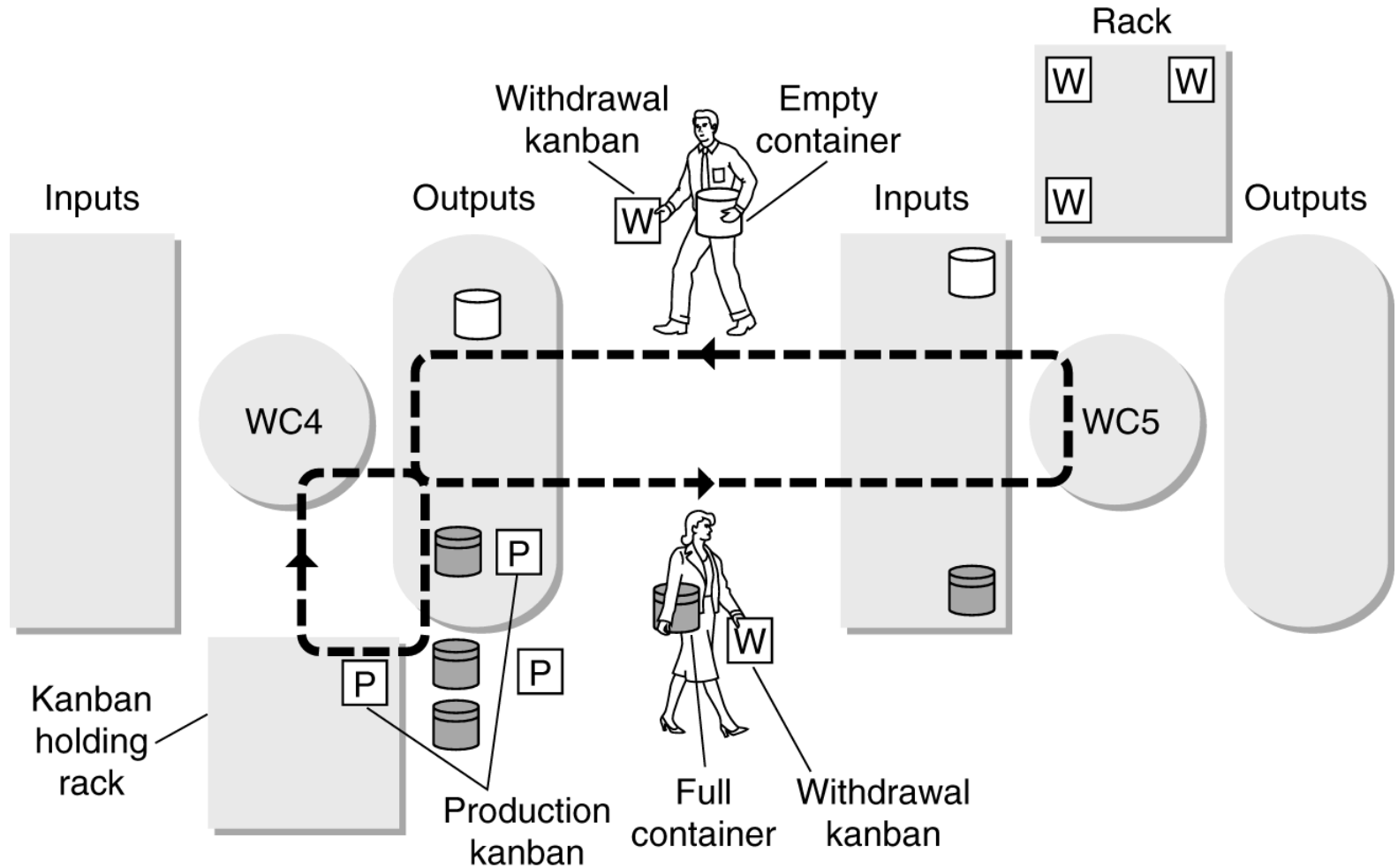
# Sequential Production System with Two Machines



# Kanban

- Kanban: Card or other device that communicates demand for work or materials from the preceding station
- Kanban is the Japanese word meaning “signal” or “visible record”
- Paperless production control system
- The idea behind this system is to authorize materials for production only if there is a need for them.
- Through the use of Kanban authorization cards, production is “pulled” through the system, instead of pushed out before it is needed and then stored.

# Kanban Process



# Layout

## ■ Traditional

- job shop approach of using widely spread-out equipment with space for stockrooms, tool cribs, and work-in-process inventories between the equipment
- To handle and move all this inventory, automated or semi automated materials handling equipment (conveyors, forklifts) is required, which takes even more space.

## ■ JIT

- Equipment is moved as close together as possible so that parts can be actually handed from one worker or machine to the next.
- Use of cells, and flow lines dictates small lots of parts with minimal work-in-process and material-moving equipment.
- manual transfer