CHAPTER 15:
Just in Time & Lean Manufacturing

Just In Time

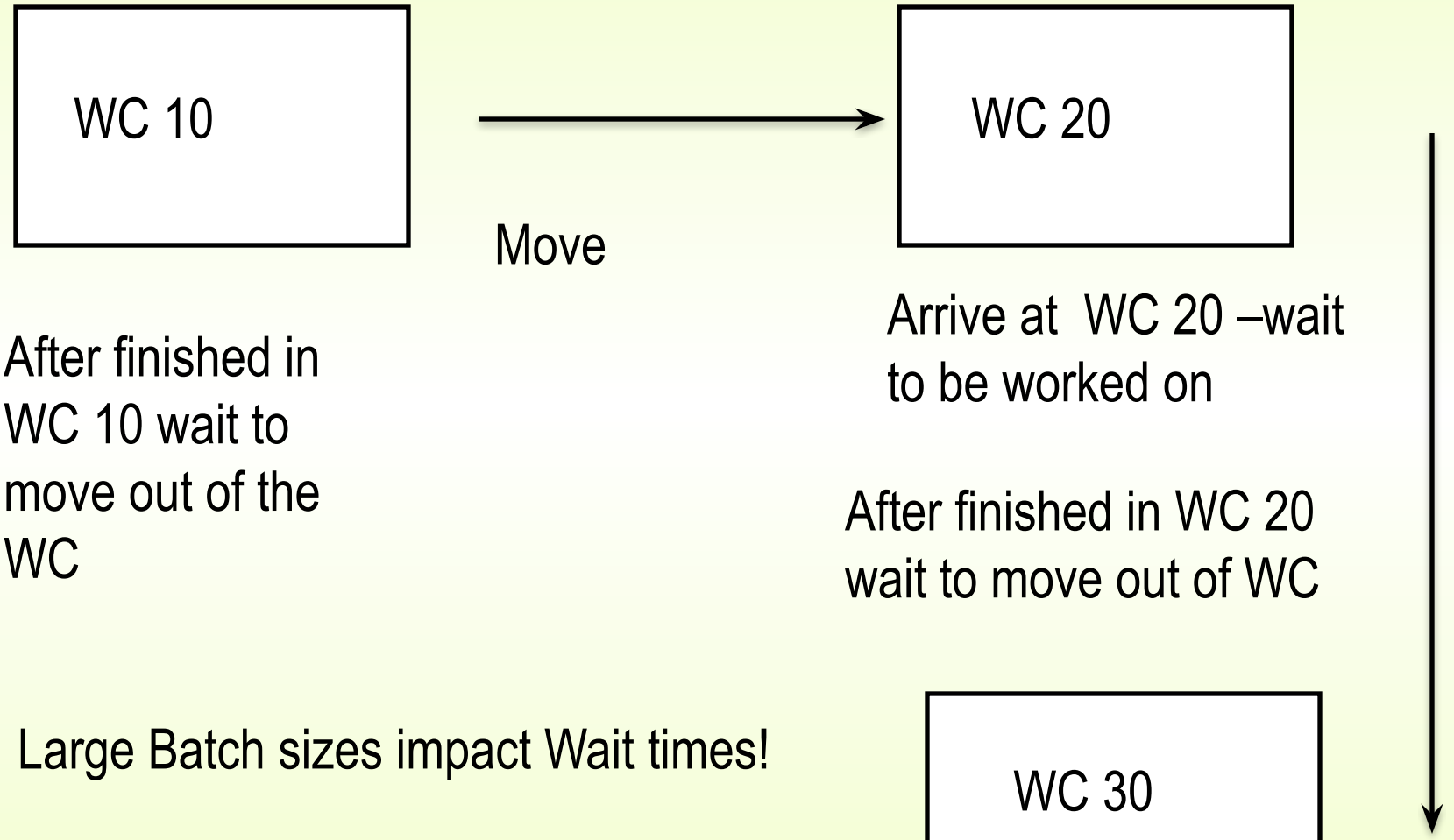
Just in Time (JIT) – a Business Philosophy

- Production system: manufacturing & movement of materials and goods occur just when they are needed, usually in small batches
- JIT operates with very little “fat” (waste)
- Defines waste in terms of customer value

JIT Goals

- Eliminate disruptions
- Make system flexible by reduce setup and lead times
- Eliminate waste, especially excess inventory

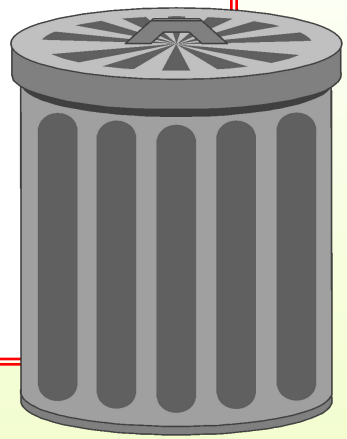
Sources of Waste: Waiting



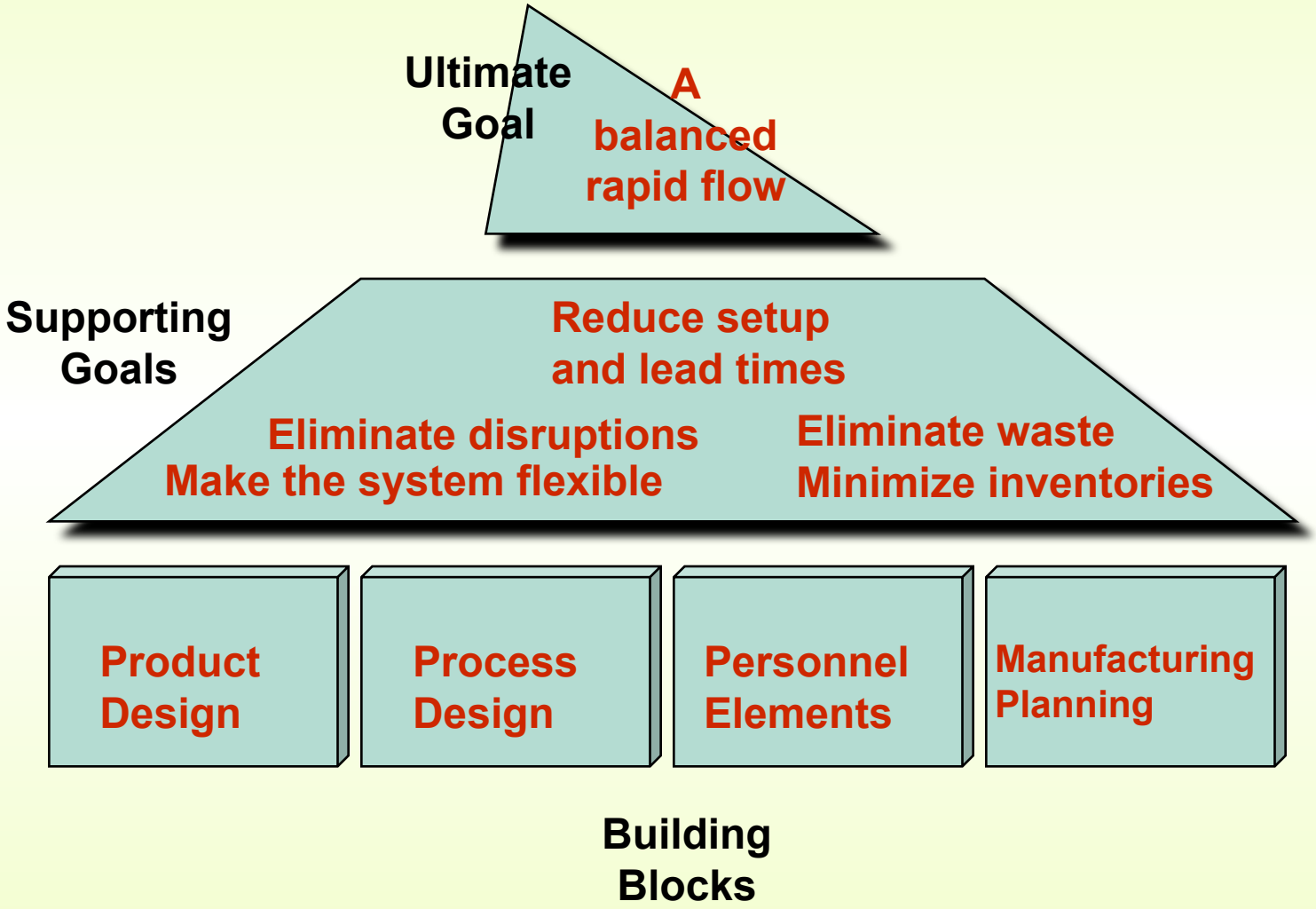
Large Batch sizes impact Wait times!

JIT Wastes

- Overproduction – making more than we can sell now
- Waiting time – for the next process
- Unnecessary handling & transportation
- Processing waste
- Inefficient work methods
- Product defects – producing bad quality items



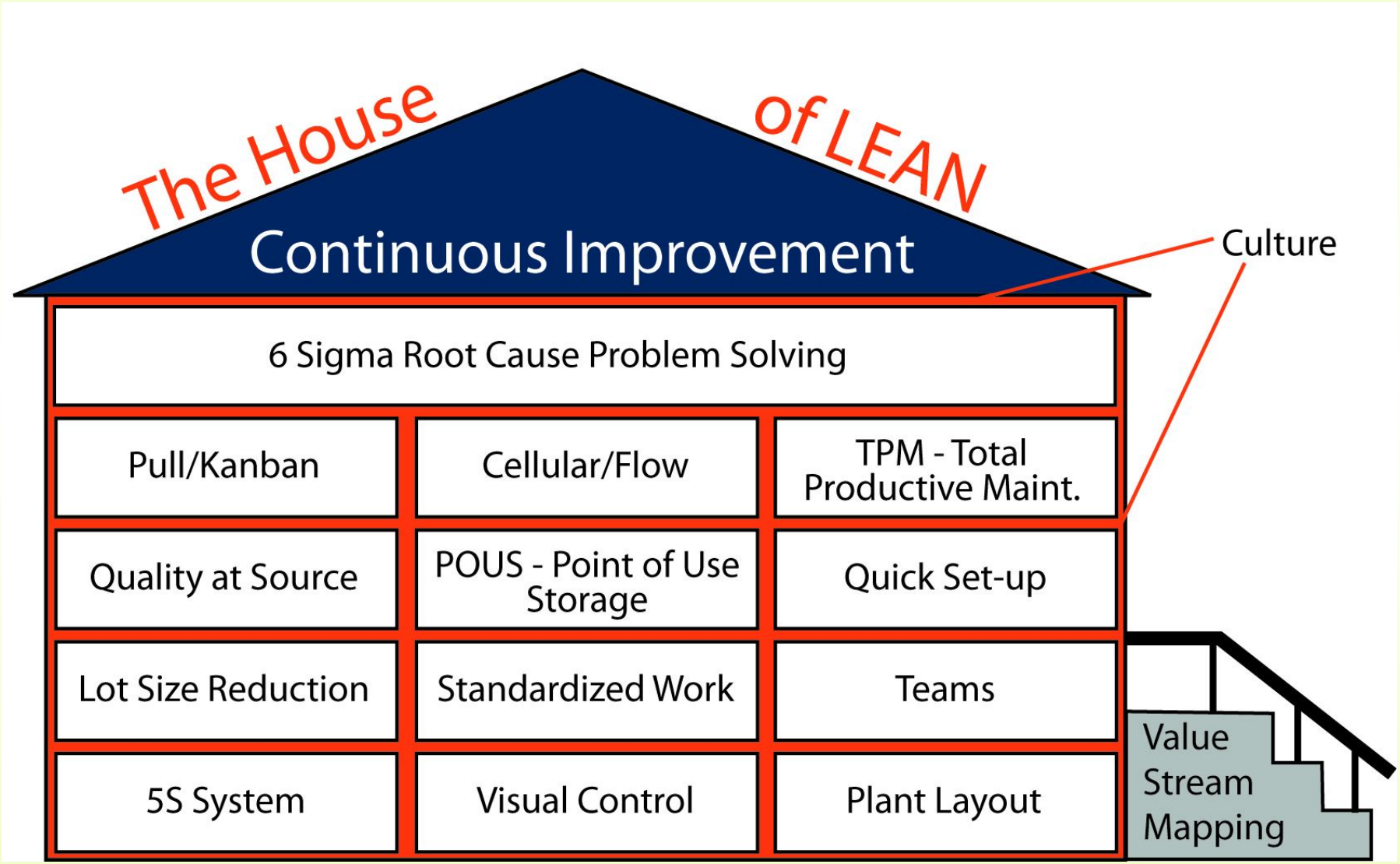
JIT Goals and Building Blocks



Production Flexibility

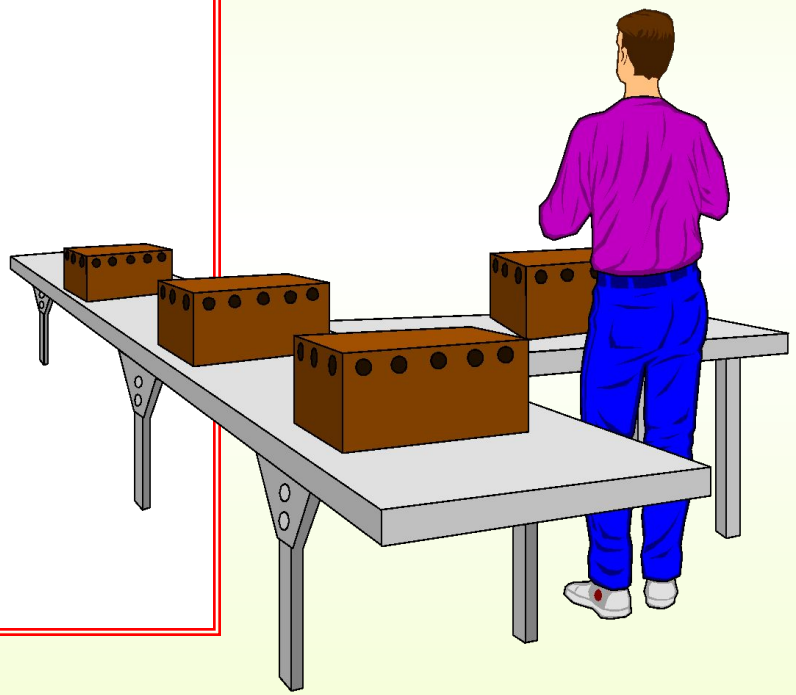
- Reduce downtime by reducing change-over time
- Use preventive maintenance to reduce unexpected breakdowns
- Cross-train workers to help clear bottlenecks – workers skilled in many different work processes
- Reserve capacity for important customers Ex. Operate at 90-95% capacity – is this a good strategy?

LEAN Manufacturing



Product Design

1. Standardized parts
2. Modular design
3. Quality
4. DFM (Design for Manufacturing)
5. Mistake-proofing design



Process Design

- Smaller production lot sizes
- Setup time reduction
- Manufacturing cells
- Quality improvements –preventive actions
- Reduced inventory

Work Cells

Examples

Benefits of Small Lot Sizes

- Reduces on-hand inventory - raw materials
- Less rework – due to quality issues
- Less storage space (warehouse) needed
- Problems become more apparent
- Increase production flexibility
- Easier to balance operations to changing customer demand

Setup Time Reductions

- Small batch sizes and changing product mixes require frequent machine setups
- Workers are trained to do their own setups
- Do as much of the set-up external from the manufacturing process
- Group Technology may be used to reduce cost and setup time (group similarly-made products)

Quality Improvement

Prevent Defects from occurring using:

- Six Sigma to reduce process variability
- Poka Yoke to mistake-proof

Autonomation:

- Automatic detection of defects during production
  Ex. Laser beams to check fill amounts of bottles

Personnel/Organizational Elements

- Workers as assets
- Cross-trained workers
- Train workers in problem-solving
- Form work cell teams

Manufacturing Planning and Control

- Level loading – keep consistent amount of production Example – always produce batches of 5 pieces
- Use Pull Systems and Kanban (card signal system) – automate production control
- Close supplier relationships with key suppliers
- Visual systems – easy to see problems. Example – green light when machine running, red light when broken down
- Preventive maintenance – to reduce unexpected machine breakdowns

Visual Controls

Pull/Push Systems and Kanban

Pull system:

- System for moving work where a workstation pulls output from the preceding station as needed. (e.g. Kanban)

Push system:

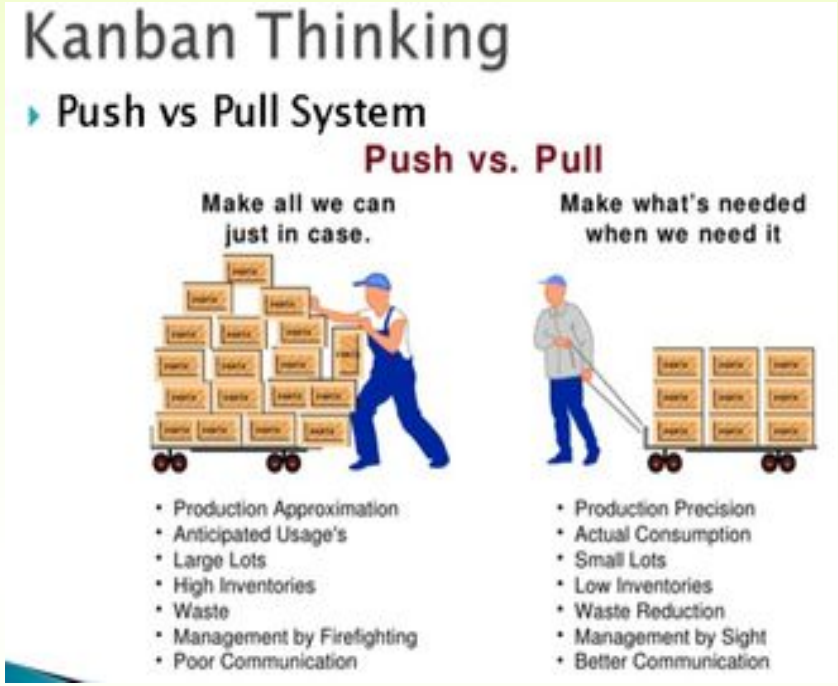
- System for moving work where output is pushed to the next station as it is completed

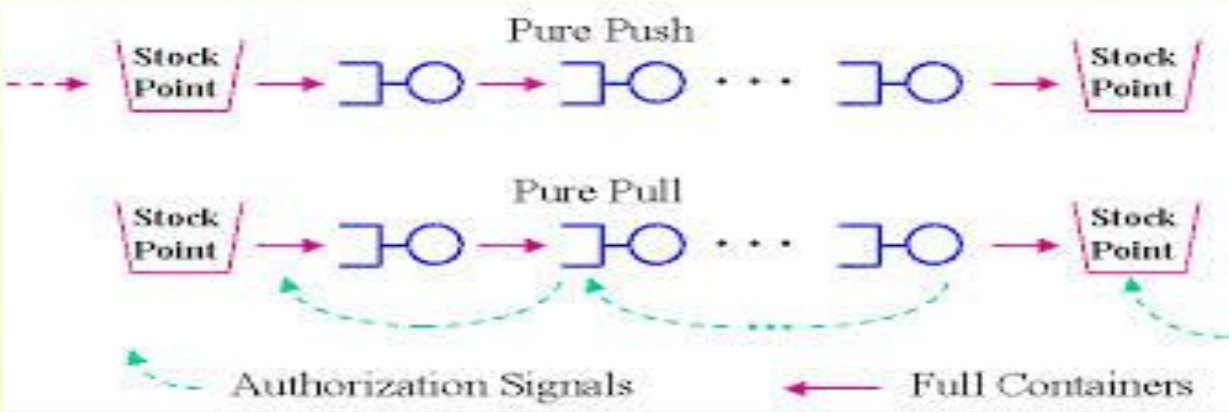
Kanban:

- Card or other device that communicates demand for work or materials to the preceding station
- Kanban: Japanese word meaning “signal” or “visible record”
- Paperless production control system
- Authority to pull, or produce comes from a downstream process.

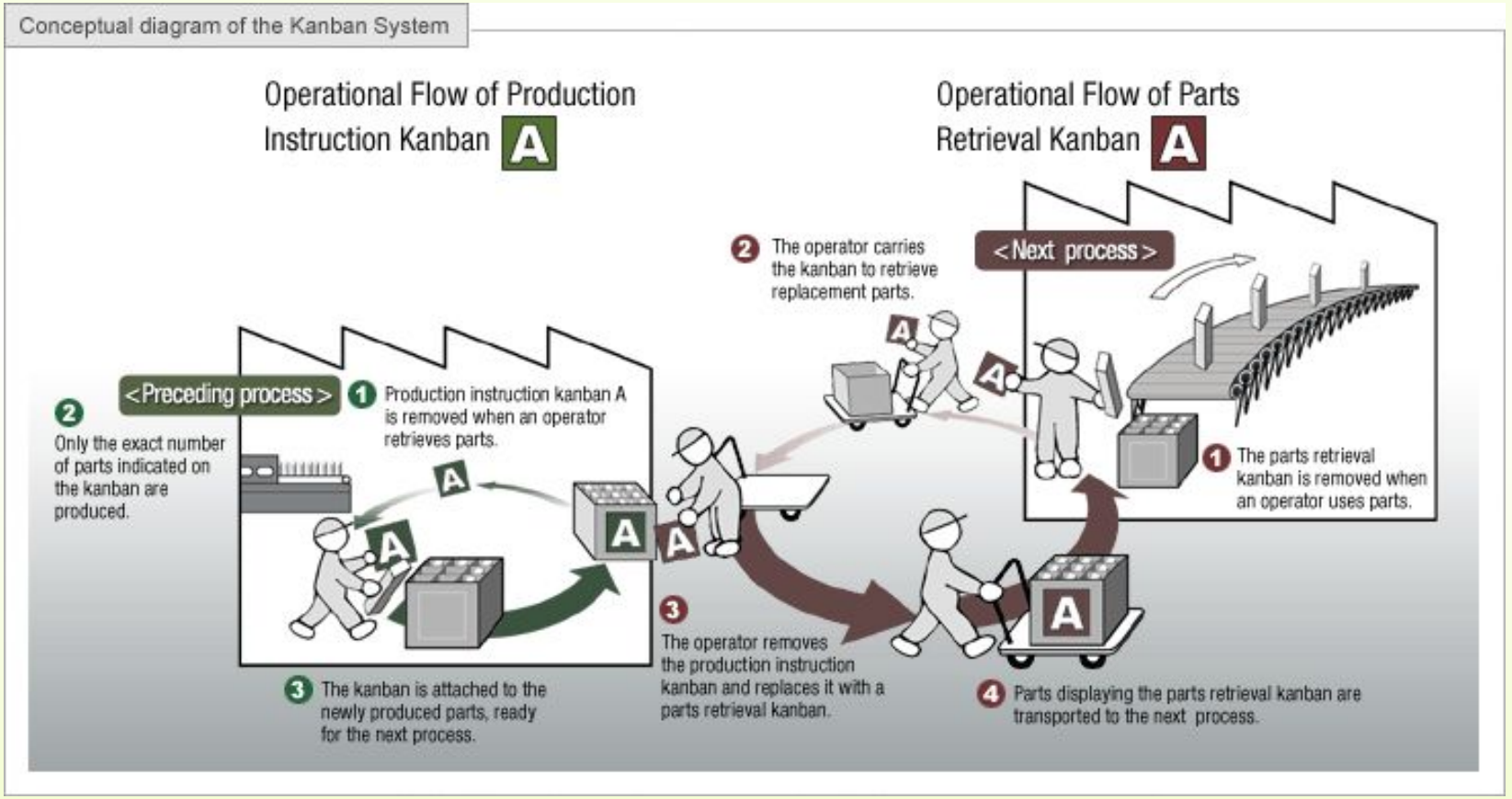
Push vs. Pull

Because of Wastes inherent in a PUSH system we tend to produce more to offset waste (including quality)





Kanban Example



Kanban Examples

Two bin system – RED means empty – Stores to replenish

Empty means – bring another!

Preventive Maintenance and Housekeeping

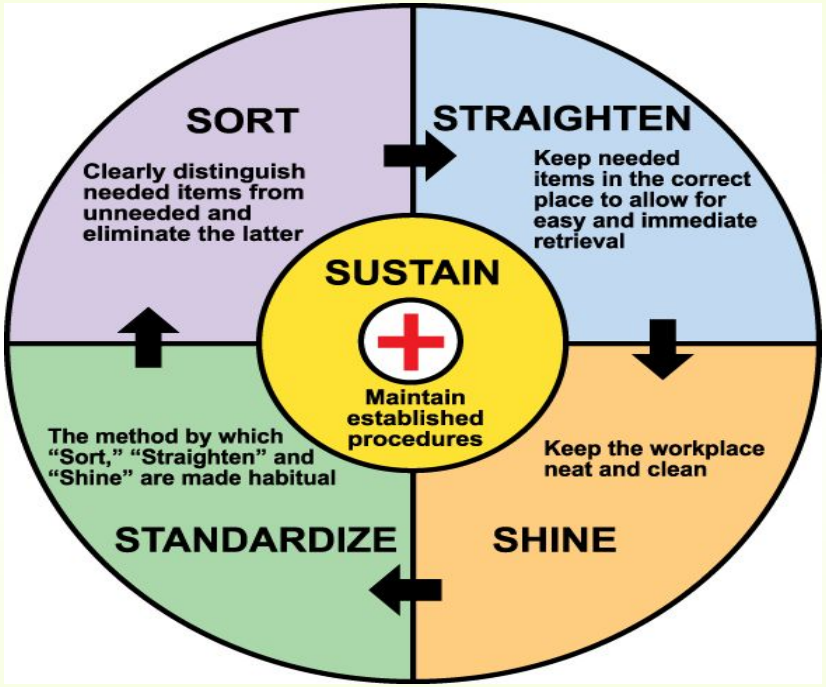
Preventive maintenance

- Maintaining equipment in good operating condition and replacing parts that have a tendency to fail before they actually do fail

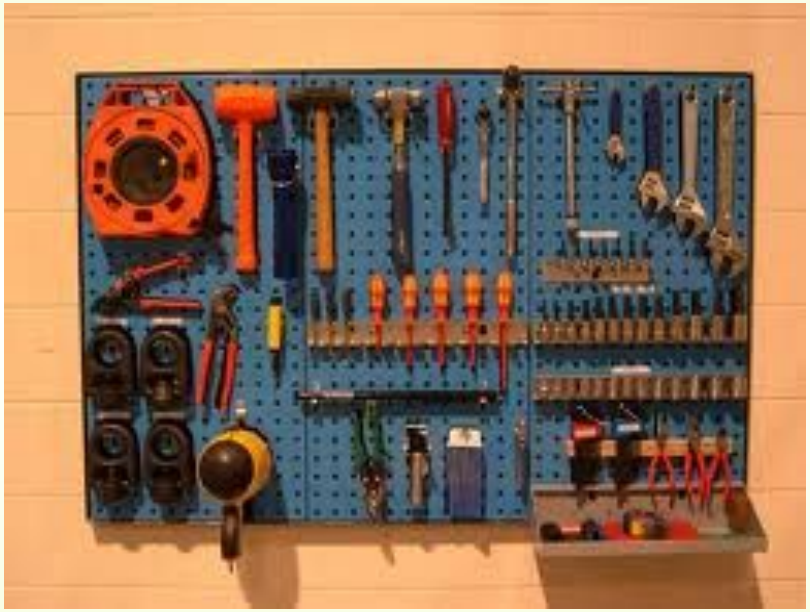
Housekeeping

- Maintaining a workplace that is clean and free of unnecessary materials (**5S program**)
  - Sort
  - Straighten
  - Shine
  - Standardize
  - Sustain

Housekeeping: 5S Program



Housekeeping – 5S Program



Tool Board

Work Station