# Overview of Lean

# Challenges Today:

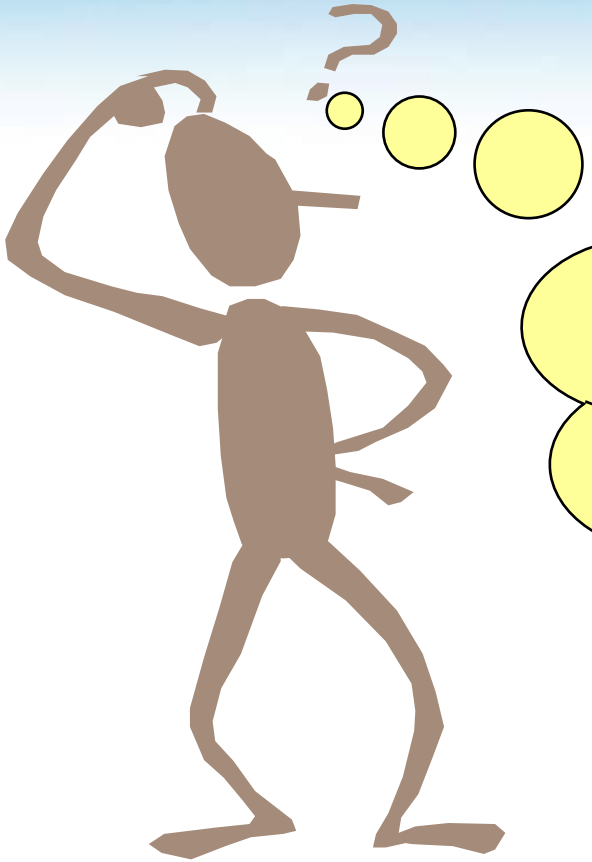
- *Costs*
- *No timely information for decision making*
- *Excess & obsolete inventory*
- *Miss deliveries*
- *Lack of performance tracking*
- *Quality issues*

# *Lean At Work……*

| MARKET | | RESPONSE |
|---|---|---|
| Lower price | → | Lower Costs |
| Shorter Customer Lead Times | → | Shorter Manufacturing Cycle Times |

## Typical Lean Implementations:

10-20% Increase in Output and a 30% Decrease in Cycle Time



# What is LEAN ?

***Lean Manufacturing*** **isn't some new diet fad.**

*It is a strategy for* ***increasing efficiency*** *that* ***shortens the time*** *between customer order and factory shipment by* ***eliminating waste****.*

# Lean is

- A collection of tools & techniques to optimize:
  - Time
  - Human resources
  - Assets
  - Productivity, and
  - Improving quality level to customers

# History of Lean

- ✓ Toyoda in textile business since 1800s
- ✓ Started making Toyota cars in 1936
- ✓ Taiichi Ohno (1950s) was assigned to improve on manufacturing system.
  - Creator of TPS
  - Father of Kanban system
- ✓ Pull production system was inspired by American supermarket
- ✓ Then known as the "*supermarket model*" of inventory control
- ✓ Developed into the '*just in time'* concept
- ✓ A whole new study of LEAN emerged later….

# The Benefits of Lean

# WHY COMPANIES INTRODUCED LEAN?

1. On-Time delivery
2. Improved response
3. Reduced inventory
4. Improved quality
5. Improved workflow
6. Achievement of flexibility
7. Culture change
8. Delegation of accountability
9. Better use of plant
10. Better use of skilled labor
11. Problems Are Visible
12. Information Flow

From Ingersoll Engineers' Study in "Making Manufacturing Cells Work" Edited by Lee R. Nyman

# INDUSTRYWEEK - BEST PLANTS

| | |
|---|---|
| Customer Rejects | Avg. 65% Reduction |
| Manufacturing Lead-time | Avg. 59% Reduction |
| Lot Size | Avg. 59% Reduction |
| On-Time Delivery | Avg. 95% |
| Approximate increase in unit sales volume for specific major products since 1990 | Avg. 208% Increase |

*From "AMERICA'S BEST - INDUSTRYWEEK'S Guide to World-Class Manufacturing Plants"*

# BUSINESS GOALS THAT "LEAN" SUPPORTS

## Turn Sales Orders into Profits as Quickly as Possible

Decrease the time period from buying or fabricating components until you get paid by the customer for the finished product.

## Increase Profits

Reduce Costs and Increase Sales.

## Use Limited Resources Wisely

People, Equipment, Buildings, etc.

# Muda (Waste) vs. Value

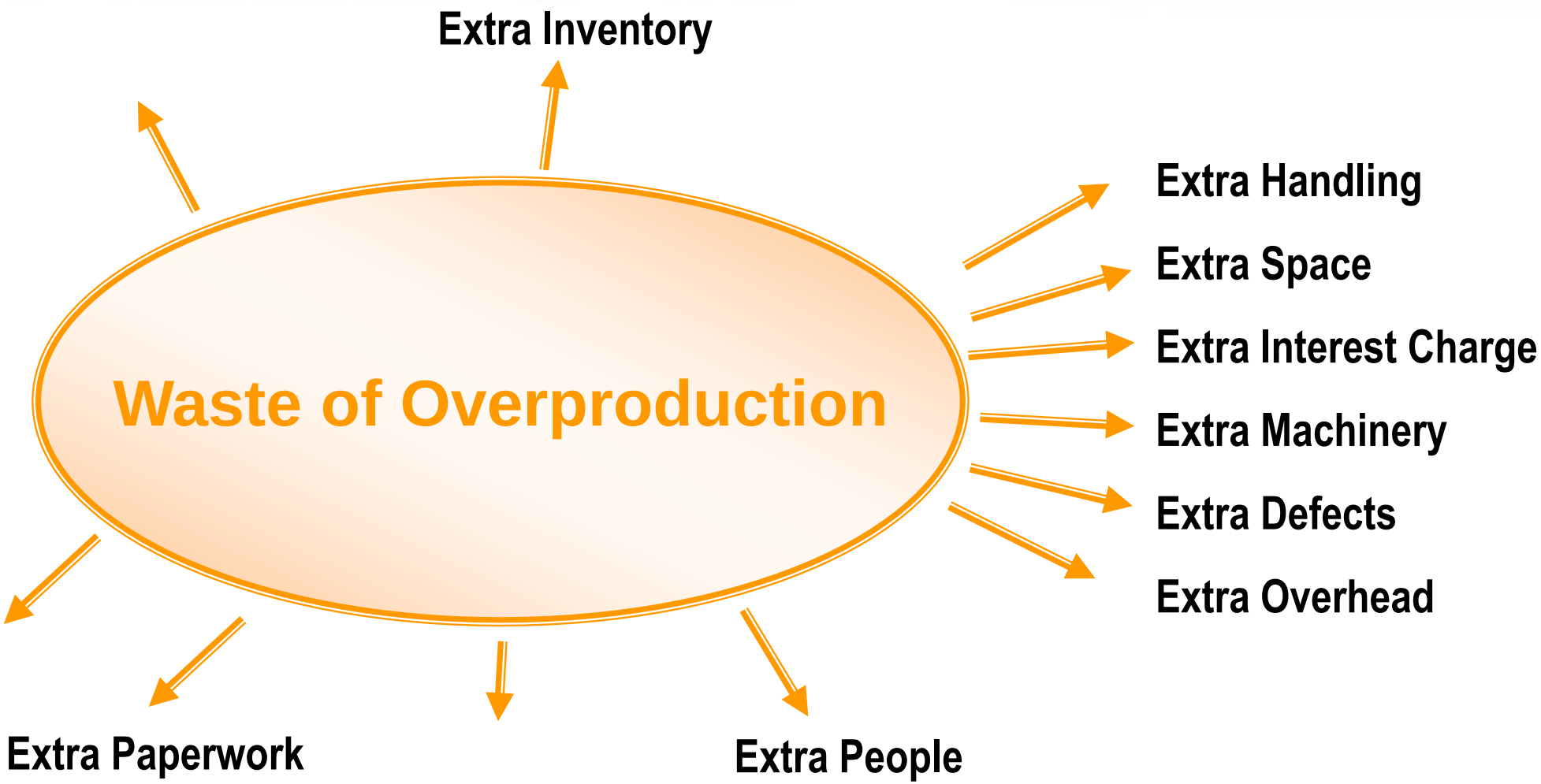
***Waste*** *= "anything other than the minimum amount of equipment, materials, parts, space, and worker's time, which are absolutely essential to add value to the product."* by Fujio Cho (Toyota)

***Value Add*** *= Activities that convert raw materials or info to meet customer requirements*

# The Seven Wastes

1. *Over-production*
2. *Waiting time*
3. *Transportation*
4. *Over-processing*
5. *Inventory*
6. *Motion*
7. *Defects*

# 1. Over-production



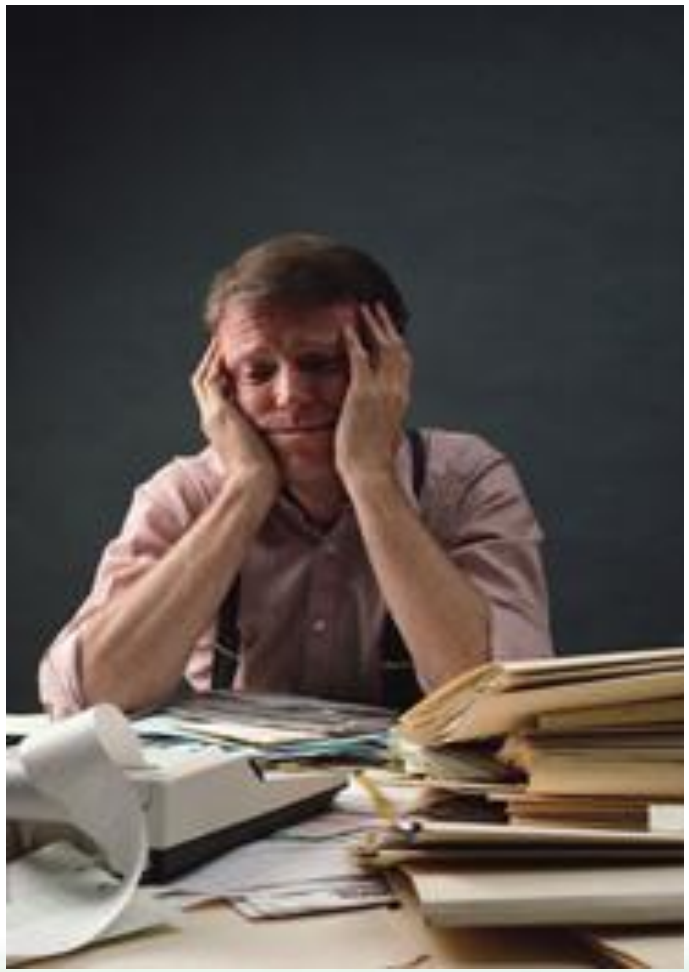

**Note:** *Machines & operators do not have to be fully utilized, as long as market demands are met.*

# Over-production

- Produce more than what customer needs
- Produce unnecessary products
- *Examples:*
  - Produce parts ahead of customer required date
  - Build a big batch more than customer req
  - Produce parts simply because machines & labor are available

# *Waiting Time*

- Easily identified
- Should be exposed – to take corrective action
- Idle time & down time (non value added time)
- *Eg.* Waiting for raw material to be delivered, waiting for PM activity to be completed, …



# *Transportation*

- Multiple handling
- Unnecessary handling
- Ill-planned layout – unnecessary long distance transportation
- To eliminate transportation waste, need improvement in:
  - Layout, coordination of process, methods of transportation, & housekeeping.

# *Over-processing*

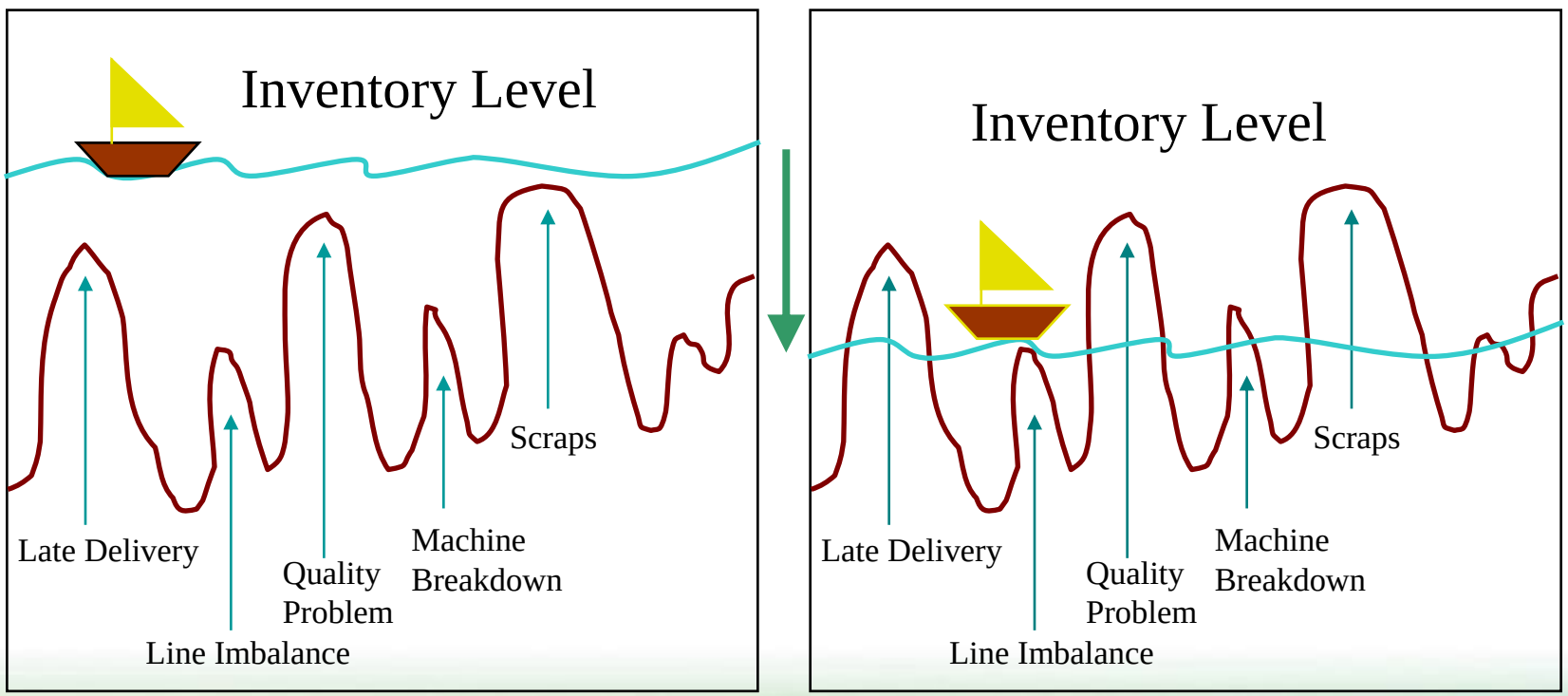
- Unnecessary processing steps (non value added work)
- Tools or fixtures are not well maintained or prepared – need extra effort in processing
- *Examples:*
  - Need additional labor to do extra filling and finishing job.
  - Inspection, deburring, washing, etc

# *Excess Inventory*

- Purchase unnecessary raw materials
- Holding unnecessary WIP & FG
- *Examples:*
  - Waiting for bin/ cart to be filled before moving to the next operations
  - A basket with 500pcs of parts waiting to be assembled after being machined

# Inventory – Root of All EVIL

Inventory hides problem:



# Inventory Holding Costs

Costs associated with holding inventory:

- Investment costs
- Inventory service costs
- Obsolescence & deterioration costs
- Insurance

# Motion

- MOVE ≠ WORK
- Time not spent in adding value to the product > should be eliminated
- *Examples:*
  - "Busy" looking for tools, walking from one machine to another, searching for parts (DC),…
  - Turn around, stretch, bend to pick up a part

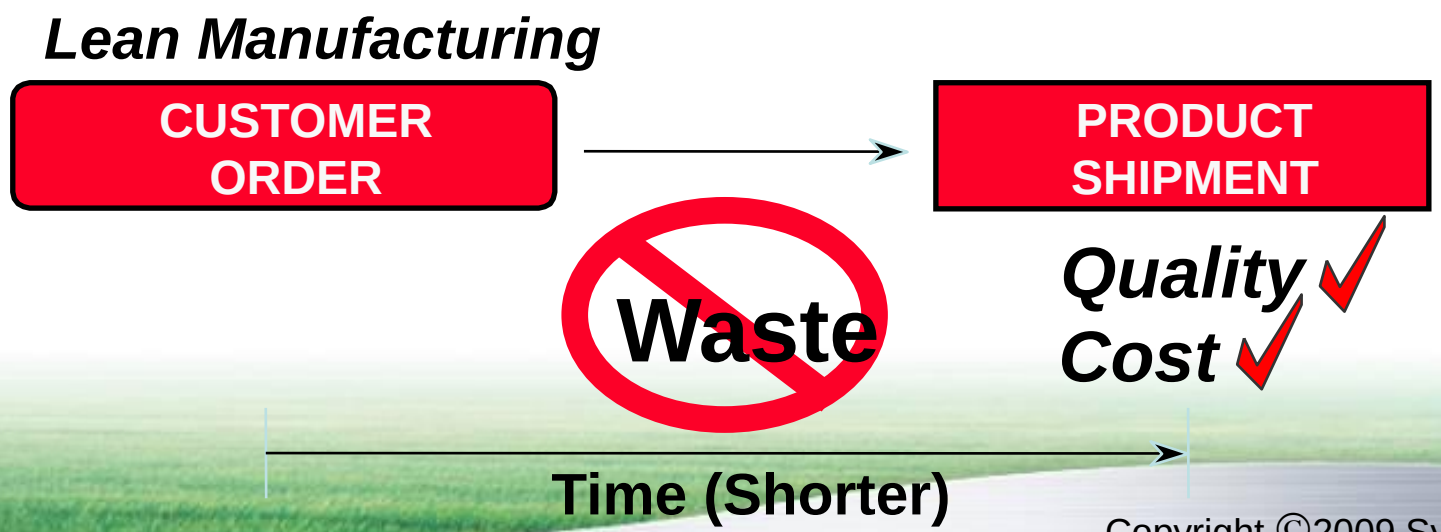
# *Defects*

- Produce parts that is scrapped or reworked
- Defects add cost to the product
- Defects create **rework, sorting** & **scrap**
- *Examples:*
  - Scrap parts that failed final inspection
  - Rework parts due to test failure

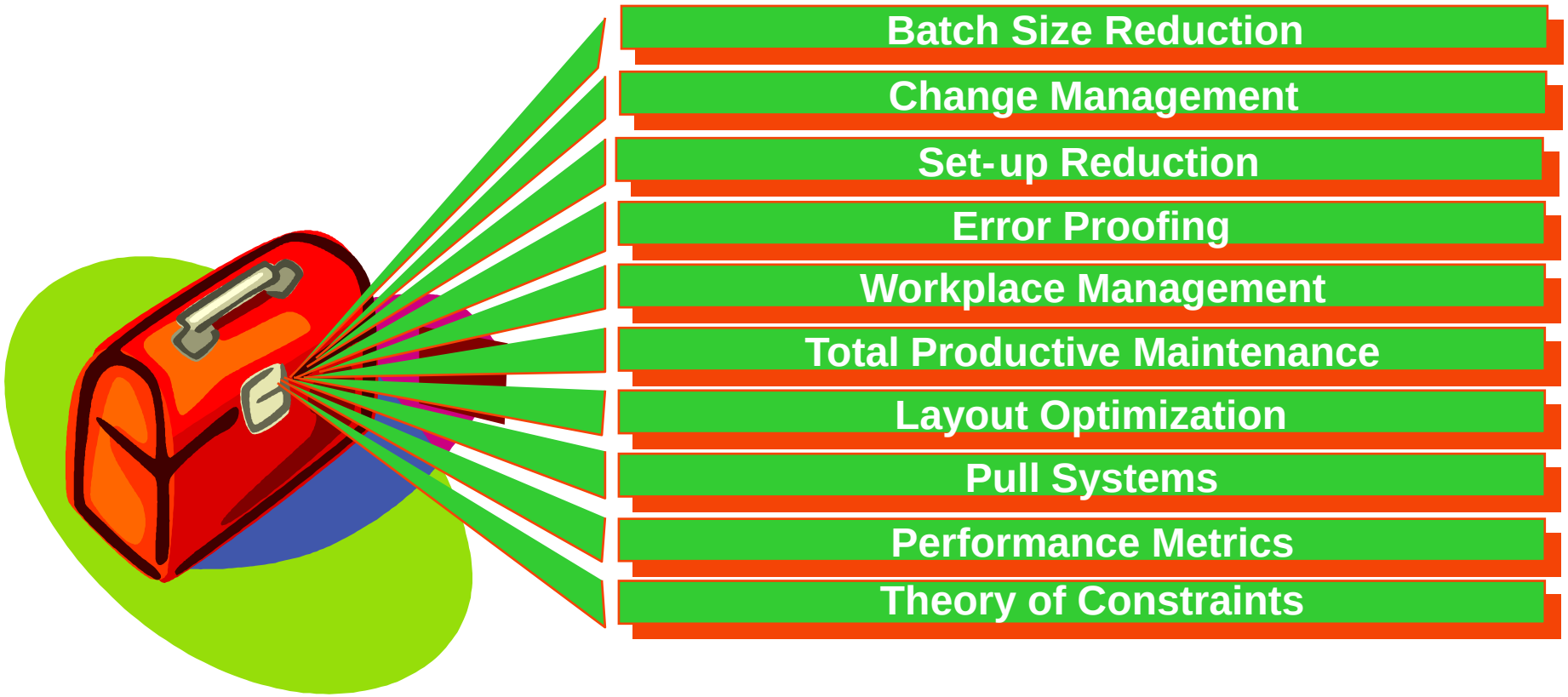
# Waste Elimination

## Traditional Organization


## Lean Organization



# The Ultimate Lean Tools




***There are many tools in the Lean Toolbox, all suited to different applications and circumstances***

# 5 Steps Towards Lean Success

- Lean Champion
- Value Stream Mapping
- ***Flow***
- ***Pull***
- Kaizen towards ***Perfection***

# How to Eliminate Wastes?

| Waste of | Solutions |
|---|---|
| Overproduction | Reduce lot sizes, Reduce setup time |
| Waiting | Synchronize work flow, Use cells, Balance workloads, Cross-training, Visual systems |
| Transport | Use cells, Compact space, Have fewer but closer suppliers, minimize # of moves for material |
| Processing | Redesign – eliminate parts/ simplify design of parts/ are all process steps necessary?, Establish std work, Fail-safe to eliminate rework |

# How to Eliminate Wastes? (cont)

| Waste of | Solutions |
|---|---|
| Inventory | Reduce lot sizes, Reduce lead times, Pull systems, minimize flow interruption |
| Motion | Make every move count – whether by people or machines, 5S, Visibility system |
| Defects | Logical quality std, Disciplined but flexible documentation, Std work, Improve process capabilities, Fail-safe processes |

# KEYS TO SUCCESS

- Prepare and Motivate People
  - Train & expose workers to CI, quality, lean concept and recruiting workers with appropriate skills
  - Create common understanding of need to change to lean
- Employee Involvement
  - Push decision making and system development down to the “lowest levels”
  - Trained and truly empowered people
- Share information and manage expectations
- Identify & empower champions, particularly operations managers
  - Remove roadblocks (I.e., people, layout, systems)
  - Make it both directive yet empowering

# What Does LEAN Give Us ?

- ***Speed - Faster response to customer's needs.***
  - **Achieved through shorter cycle time and lower inventory.**
  - **Tools employed : Batch size reduction, pull system, layout optimization.**

- ***Flexibility - Capacity to adapt to changes in the external environment.***
  - **Achieved through a flexible workforce and work system**
  - **Tools employed : Set up time reduction, shop floor management, change management.**

- ***Quality - Customer satisfaction through continuous improvement of work process.***
  - **Achieved through a well informed and highly involved workforce as well as a robust work system.**
  - **Tools employed : Visual management, Total Productive Maintenance, Error proofing.**