

Lean Enterprise

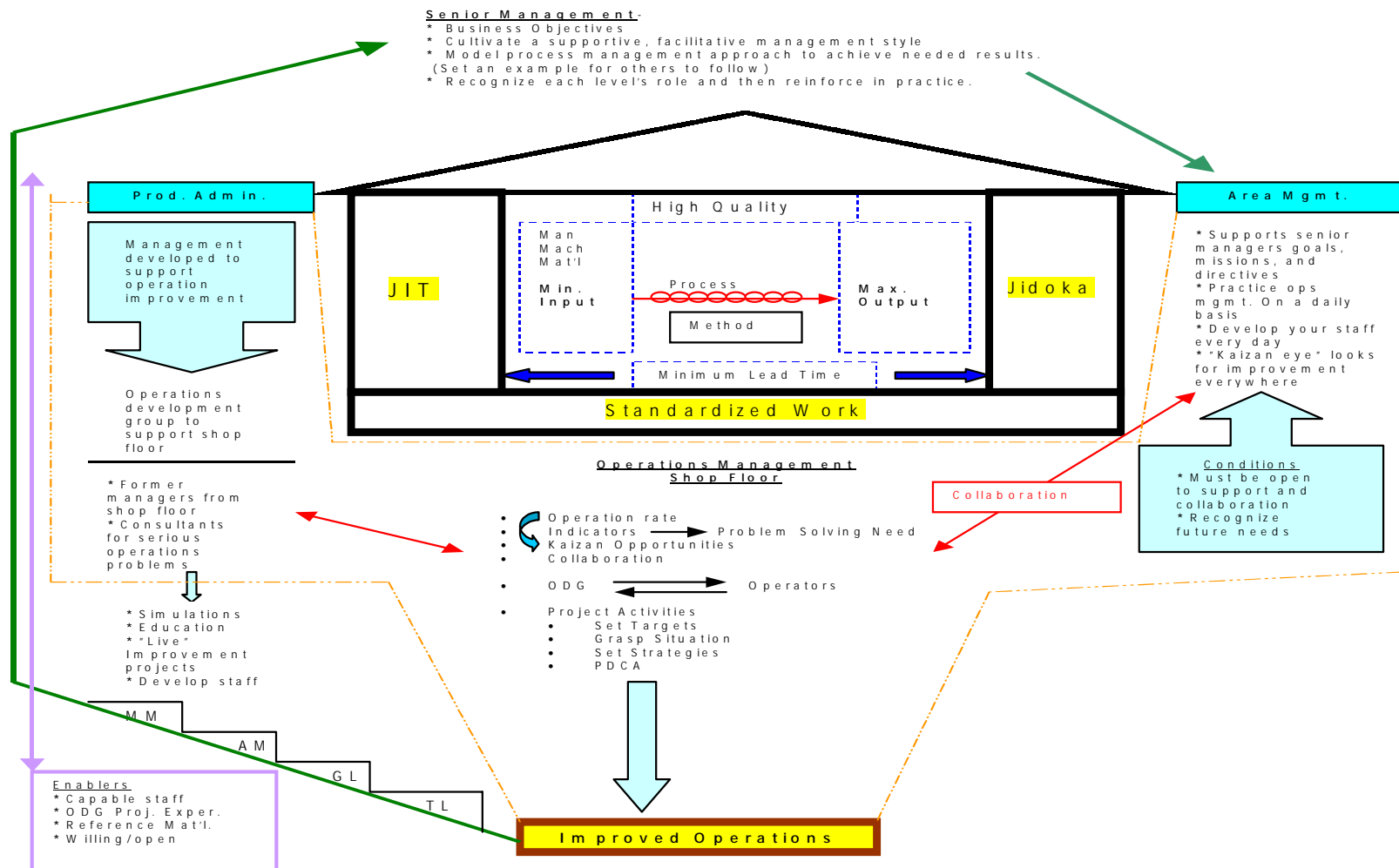
The "Lean Enterprise" concept represents a new paradigm in the way businesses are managed in highly competitive market environments. This concept embodies a collective set of principles, tools and application methodologies that enable companies to **remove waste** from the system and achieve dramatic competitive advantages in **speed to market, cost, quality, and delivery performance.**

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Lean Enterprise

- Uses **time** and the “relentless pursuit of **waste elimination**” as competitive leverages
- Seeks to make **value flow** from raw material through consumption
 - Using least amount of resources (time, people, materials, etc.)
- Creates a **culture** of never-ending **improvement** at all organization levels
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Toyota Management System



The Goal

Turn Manufacturing into a Competitive Weapon

To paraphrase Tom Peters' "Turn Manufacturing into a Marketing Weapon," a chapter in *Thriving on Chaos*

Manufacturing as a Competitive Weapon

- Shorter throughput (order to delivery)

- Lower costs

- Higher quality

- More flexibility

Simultaneously.

The Strategy

Constantly shorten the time
it takes to convert
customer orders into deliveries.

Toyota Motor Company,
Toyota Production System, p. 2

The Plan

Implement the
Toyota Production System
Adapted to the Industry and Company

Implementing the TPS

“Cost Reduction Is the Goal”

There are two ways to increase efficiency: 1) increase production quantity or 2) reduce the number of workers—Taiichi Ohno.

In the short term, you may need to


• **Reduce people at all levels in the organization**

Over time, lower costs, higher quality, and faster development & production times will increase sales.

Manufacturing
as a
Competitive
Weapon

A Lean Paradox (Just One of Many)

Reducing costs means reducing people, but if you eliminate people as a result of improvement, you will get no more improvement.

- **Resolve how to maintain mutual trust while reducing people**
- 

The Toyota Production System clearly reveals excess manpower...

Management's responsibility is to identify excess manpower and utilize it effectively.

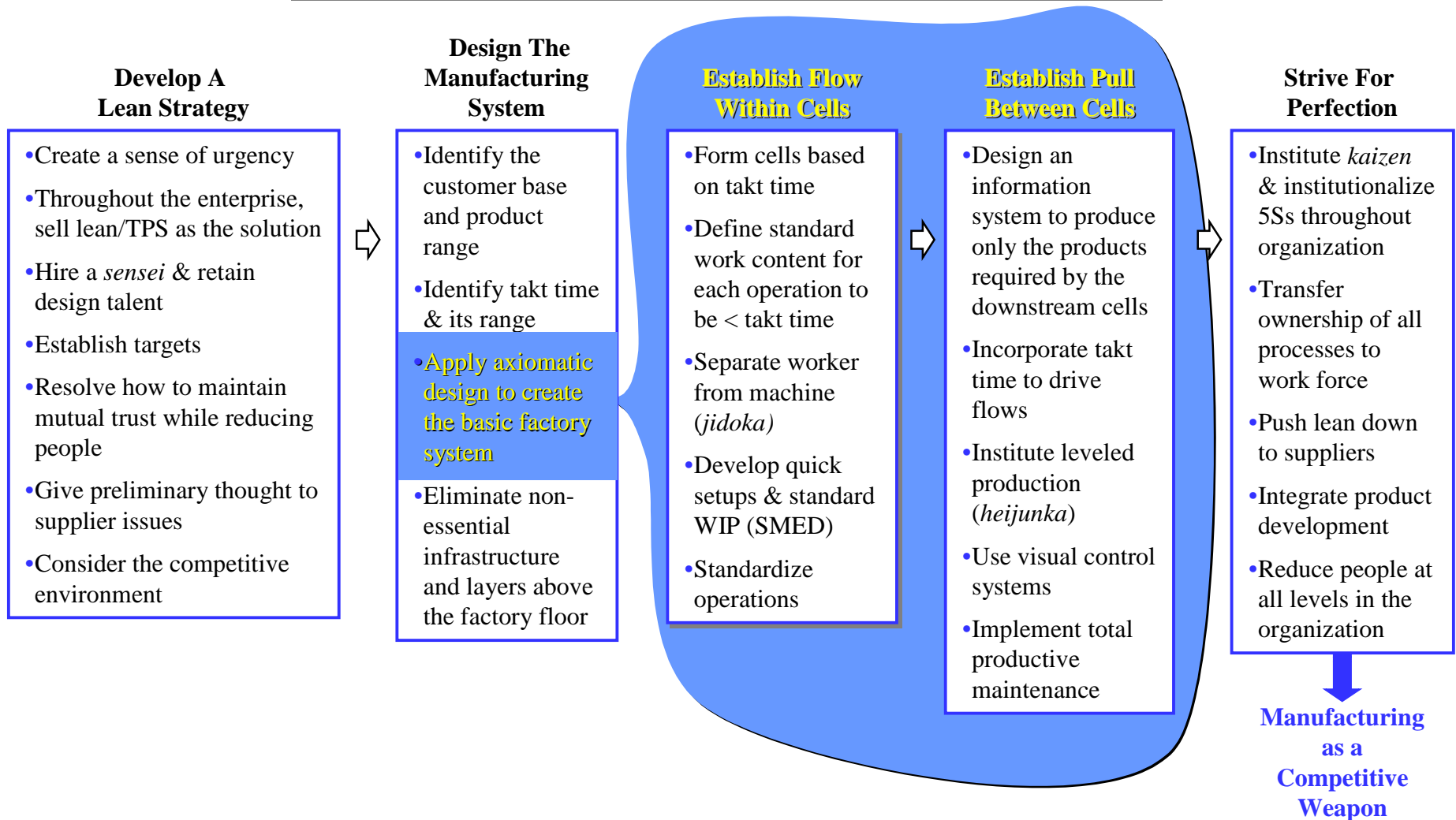
Hiring people when business is good and production high just to lay them off is a bad practice.

On the other hand, eliminating wasteful and meaningless jobs enhances the value of work for workers.

Taiichi Ohno.

Implementing the TPS

All activities must support the goal of "shortening the time it takes to convert customer orders into deliveries." Toyota Motor Corporation, 1992



LEAN PRINCIPLES

- VALUE
 - VALUE STREAM
 - FLOW
 - PULL
 - PERFECTION
- "LEAN THINKING"
- by JAMES P. WOMACK
and DANIEL T. JONES

LEAN PRINCIPLES

VALUE

VALUE IS DEFINED BY THE
CUSTOMER AND EXPRESSED IN
TERMS OF A SPECIFIC PRODUCT
WHICH MEETS THE **CUSTOMER'S**
NEEDS AT A SPECIFIC PRICE AT
A SPECIFIC TIME.

LEAN PRINCIPLES

VALUE STREAM

THE VALUE STREAM IS THE SET OF ALL THE **SPECIFIC ACTIONS** REQUIRED TO BRING A **SPECIFIC PRODUCT** THROUGH THE THREE CRITICAL **MANAGEMENT TASKS** OF ANY BUSINESS: **PROBLEM-SOLVING** (RUNNING FROM CONCEPT TO PRODUCTION LAUNCH), **INFORMATION MANAGEMENT** (FROM ORDER-TAKING TO DELIVERY), AND **PHYSICAL TRANSFORMATION** (FROM RAW MATERIALS TO FINISHED PRODUCTS IN THE HANDS OF THE CUSTOMER).

VALUE STREAM ANALYSIS

IDENTIFY THREE TYPES OF ACTIONS:

1. THOSE THAT CREATE VALUE
2. THOSE THAT CREATE NO VALUE
BUT ARE UNAVOIDABLE GIVEN
CURRENT TECHNOLOGY
3. THOSE THAT CREATE NO VALUE
AND ARE IMMEDIATELY
AVOIDABLE

LEAN PRINCIPLES

FLOW

MAKE THE VALUE CREATING STEPS
MOVE **CONTINUOUSLY**.

LEAN PRINCIPLES

PULL

LET THE **CUSTOMER** PULL THE
PRODUCT **AS NEEDED**.

LEAN PRINCIPLES PERFECTION

CONTINUOUSLY SEEK TO **IMPROVE
VALUE**, MAKE FLOW MORE
CONTINUOUS, AND THE ABILITY
OF THE CUSTOMER TO PULL
FASTER.

LEAN PRINCIPLES

KEY ACTIONS

- 1. TIME BASED COMPETITION**
- 2. MUDA (WASTE) ELIMINATION**

MUDA - OHNO'S SEVEN WASTES PLUS

- 1. OVERPRODUCTION**
- 2. WAITING**
- 3. TRANSPORTING**
- 4. INAPPROPRIATE PROCESSING**
- 5. UNNECESSARY INVENTORY**
- 6. UNNECESSARY MOTIONS**
- 7. DEFECTS**
- 8. UNTAPPED HUMAN POTENTIAL**
- 9. INAPPROPRIATE SYSTEMS**
- 10. ENERGY AND WATER**
- 11. POLLUTION**

ORGANIZATIONAL STRATEGIES

1. AGILITY

2. VIRTUAL MANUFACTURING

DESIGN STRATEGIES

- 1. MASS CUSTOMIZATION**
- 2. DESIGN FOR PRODUCTION (DFP)
AND DESIGN FOR ASSEMBLY (DFA)**
- 3. QUALITY FUNCTION
DEPLOYMENT (QFD)**
- 4. TRIZ (CREATIVE PROBLEM
SOLVING)**
- 5. ROBUST DESIGN**

IMPROVEMENT

- 1. 5S – SORT, STRAIGHTEN, SCRUB, STANDARDIZE, SELF-DISCIPLINE**
- 2. KAIZEN**
- 3. KAIKAKU (KAIZEN BLITZ)**
- 4. ROOT CAUSE ANALYSIS**
- 5. TIME CHARTING (PROCESS FLOW CHARTING)**

PRODUCTION

- 1. KANBAN**
- 2. SET-UP REDUCTION**
- 3. MIXED MODEL PRODUCTION**
- 4. DEMAND SMOOTHING**
- 5. GROUP TECHNOLOGY**
- 6. BOTTLENECK REDUCTION
(THEORY OF CONSTRAINTS)**

QUALITY

1. SHORT RUN STATISTICAL
QUALITY CONTROL
2. POKAYOKE (FAILSAFING)
3. ZERO DEFECTS
4. SIX SIGMA

A TPS Glossary

- **5Ss**—five Japanese words, all beginning with an “s” sound, which establish the cultural environment for continuous improvement
- **Cycle time**—for a machine or cell, time from completion of one item to completion of the next. Cycle times must harmonize with *takt time* (which defines **balanced production**). Often confused with **throughput time**, which is the length of time a part is in the cell (also, “factory throughput time,” from the start of production to delivery).
- **Heijunka**—(fm. Japanese*, “smoothing, making level”) production leveling. Involves producing in sequences like abacababac rather than aaaaabbbcc (where a, b, and c are models or products). Solves problems inherent in the TPS that can cause queuing and line stoppages.
- **Jidoka**—(fm. Japanese, “automation with human characteristics”) separation of worker and machine. Implies that machines will stop if an error occurs. Alternative is “people watching machines work.” Allows manning of cell to vary with demand. Encourages teamwork and facilitates *kaizen*.

Dr. C. W. Richards 1/12/99

*Many thanks to Lennart Kampman of the Copenhagen Business School for his translations and interpretations.

A TPS Glossary, II

- ***Just-in-time***—“In a flow process, the right parts needed in assembly reach the assembly line at the time they are needed and only in the amount needed.” (Ohno, p. 4). As Ohno explains, this does *not* imply that the parts must arrive exactly *when* needed. Instead, a pull (*kanban*) system is used. Toyota explains that the goal of JIT is “to translate each order into a delivery of a finished, quality vehicle as quickly and efficiently as possible.”
- ***Kaizen***—(fm. Japanese “kai,” change, modify, improve and “zen,” goodness, virtue - not the zen in Zen, which comes from the original Chinese, “Chan”) continuous improvement. Activities carried out by the members of a cell or other unit in order to improve production within that unit. May involve work process or machines. Ultimate goal is to shorten throughput times and increase the ratio of processing (“value added”) time to total time, leading to an eventual reduction in manpower. Other improvement efforts are ***kaikaku***, or radical change, carried out under the direction of *sensei*.

A TPS Glossary, III

- ***Kanban***—(fm. Japanese for “signboard”) Primary means for controlling production in the TPS. Kanban are usually cards that the downstream cells take to the upstream cells in order to withdraw (pull) parts. The upstream cell then uses the kanban as shop orders to replenish just the parts taken.
- ***Lean production***—producing with a shorter delivery span, at lower cost, with greater quality, and with more flexibility (variety on the line; quicker introduction of new models)
- ***Sensei***—teacher, commonly of the martial arts; used to denote an expert with a track record of implementing the TPS
- ***SMED***—single minute exchange of dies. Very rapid set-ups so that *heijunka* sequences can be produced economically

A TPS Glossary, IV

- ***Takt time***—(fm. the German for meter or measure, as in music) pace of customer demand. Time to produce one item sold, e.g., a car every **2 minutes** or an aircraft every **8 days**. *Cycle times* of all components of the factory must harmonize with takt time (axiomatic design ensures this), or shortages & build up of inventory will occur.
- ***Toyota Production System (TPS)***—only known example of a lean production system. Pillars of the TPS are just-in-time (pull) and *jidoka*. These rest on leveled (*heijunka*) & balanced production, and lead time reduction, which depends on reducing set-up times to under 10 minutes (ideally less than 1). The basic form evolved at Toyota from 1948 to 1973, largely under the guidance of Taiichi Ohno.

A TPS Glossary, V

- ***Total Productive Maintenance***—ensuring that machines are 100% available during the production period. Generally requires operating machines at well under full utilization to allow time for maintenance & modification
- ***Value added***—a term used by Toyota only in connection with *kaizen*, where it is generally synonymous with “processing” (see Ohno, p. 57)
- ***Visual control***—management by sight. The TPS arranges the factory so that abnormalities stand out and so can (and will) be eliminated.

More info? Most of these terms are well defined and illustrated in *Lean Thinking*, by James P. Womack and Daniel T. Jones (New York: Simon & Schuster, 1996)