Discussion On TPS/Lean Manufacturing & Profits

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TPS/Lean is a widely accepted improvement program

- Starting from simple roots in Toyota in the 1950's TPS has spread around the world to become a dominant improvement methodology
- Toyota will overtake GM in 2006 or 2007 as the automotive industry leader in volume and add this to their already dominant positions in quality and profitability
- TPS has been "discovered" by multiple people over the years and identified as various different items such as:
  - QC circles
  - Kanban system
  - Kaizen events
  - Value stream mapping
  - What's next?
- Yet, no one has been able to copy this elusive system very easily and produce the same type of results…Why?

Multiple possible explanations exist…

- Toyota took about 20 years or so between 1950-1970 to build up the system and implement it across several plants. Most practitioners are in about year five or less…

- A short term emphasis in our U.S. business model keeps us overly focused on quarterly profits…

- There is a shortage of talented TPS implementation leaders…Most of us don't have Taiichi Ohno for example.

- Perhaps creating this new system in companies with an established culture and old way of doing things is just inherently very difficult…

- The methods and techniques most companies are using are either just insufficient or incorrect…

- Other possible reasons that you might add?

TPS is viewed is the U.S. through a very "lean" lens…
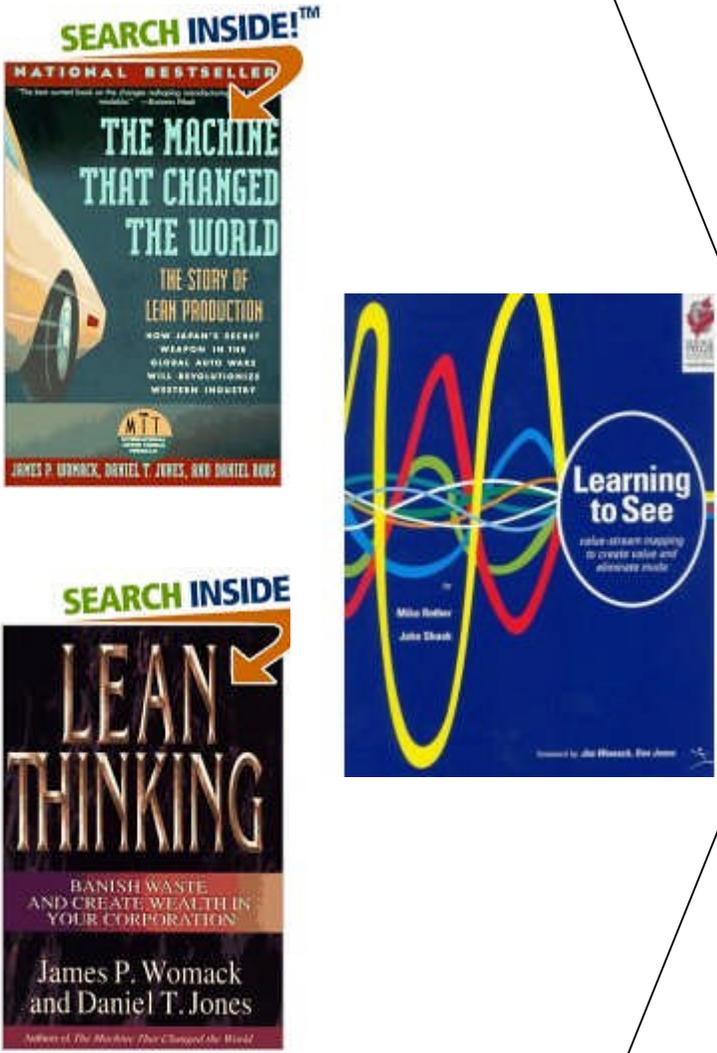
LTS Q's - Map the value stream

1. What is takt time?
2. Where can you use continuous flow?
3. What is the pacemaker?
4. Where will you need a supermarket pull system?
5. Will you build to a finished goods supermarket or to customer order?
6. How will you level production mix at the pacemaker?
7. What increment of work will you consistently release and take away at the pacemaker?
8. What process improvements will be necessary for the value stream to flow as your future state design specifies?

A lens affects how well and what you see…
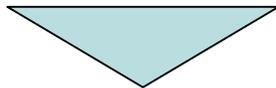
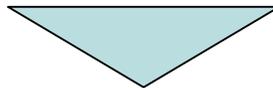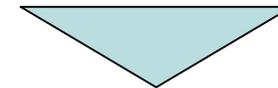| Eye Glasses	Microscope	Telescope
Blurred image	Small image	Distance image
▽	▽	▽
Clear image	Magnified image	Closer image

But one size does not fit all in any case!

Major paradigm shift from Mass to Lean

Mass Production

- Economy of scale

- Dedicated machines

- Dedicated job classifications

- Few changeovers / large batch

- Improvements by new manufacturing technology

- Improvements by engineers & management

- Inspect in quality

- Always run machines

- High inventory

- Apparent efficiency is king
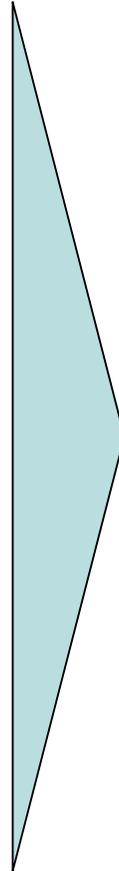
Lean Production

- Economy of scope, speed

- Flexible systems

- Cross trained multi-functional workers

- Frequent changeover / small batch

- Improve the method first, then technology next only as a second step

- Improvements by work teams, supervisors, engineer, & management

- Build in quality

- Run only on demand

- Low inventory

- True efficiency is key
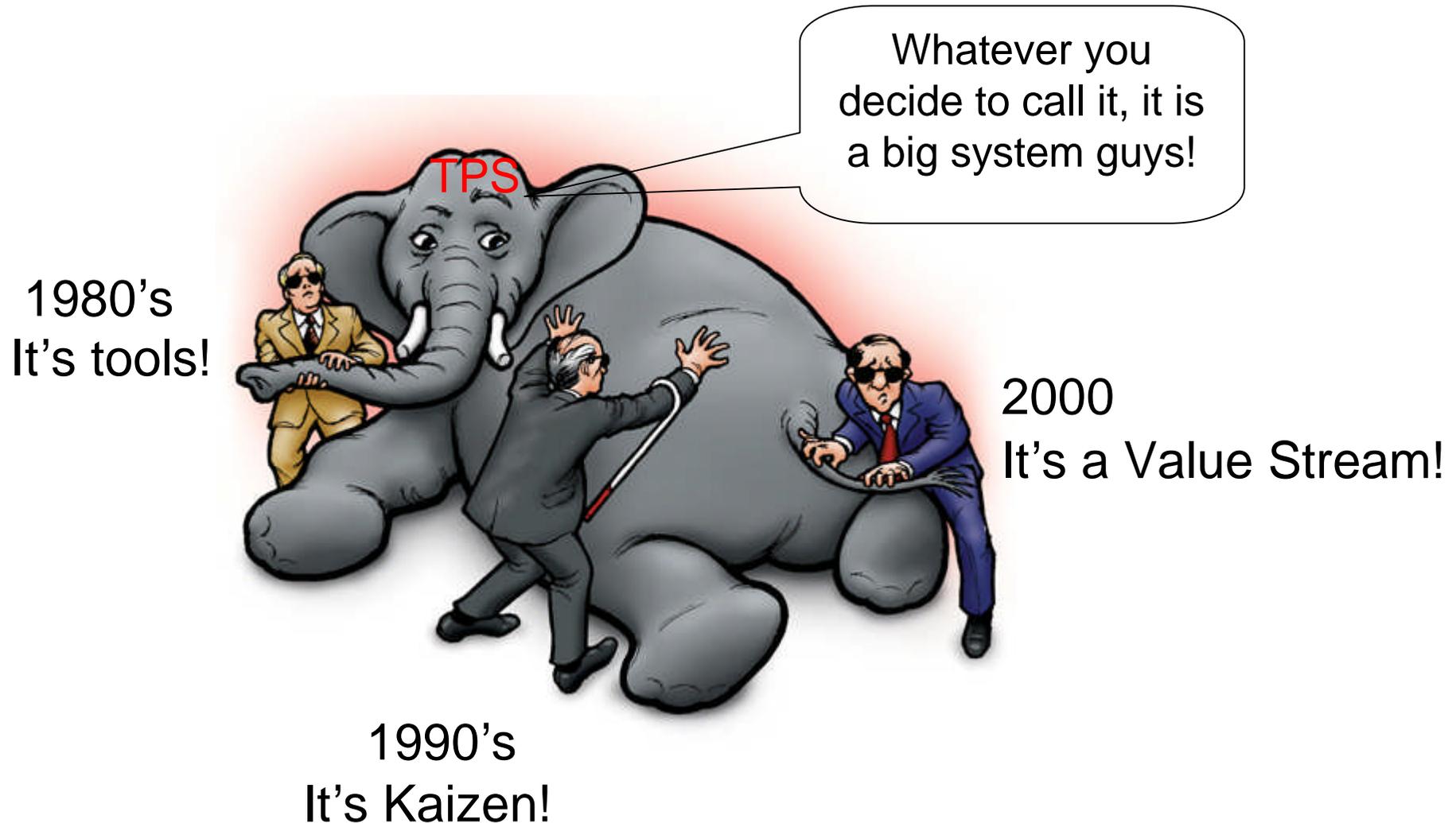
TPS actual history: Timeline – Selected Events

1937   Start of Toyota Motor Company

1945   End of 2nd world war

1950   Trips to America to visit Ford / Supermarkets observation / TPS start

1951   Initial supervisor training using TWI material

1955   Emergence of more "efficient production system" (Machining plant with flow, multi-process handling, visual control, standardized work, basic pull)

1961   TQC efforts begin (driven by Eiji Toyota)

1962   Synchronization of plants and full kanban adoption across company

1965   Toyota awarded Deming prize for quality

1969   Toyota establishes OMCD / TPS codification strengthens

1971   Toyota related plants awarded TPM award

1972   Regular supplier improvement workshops commence

1973   **TPS basic format complete and initial handbooks drafted***

1984   First major TPS launch overseas (NUMMI in US)

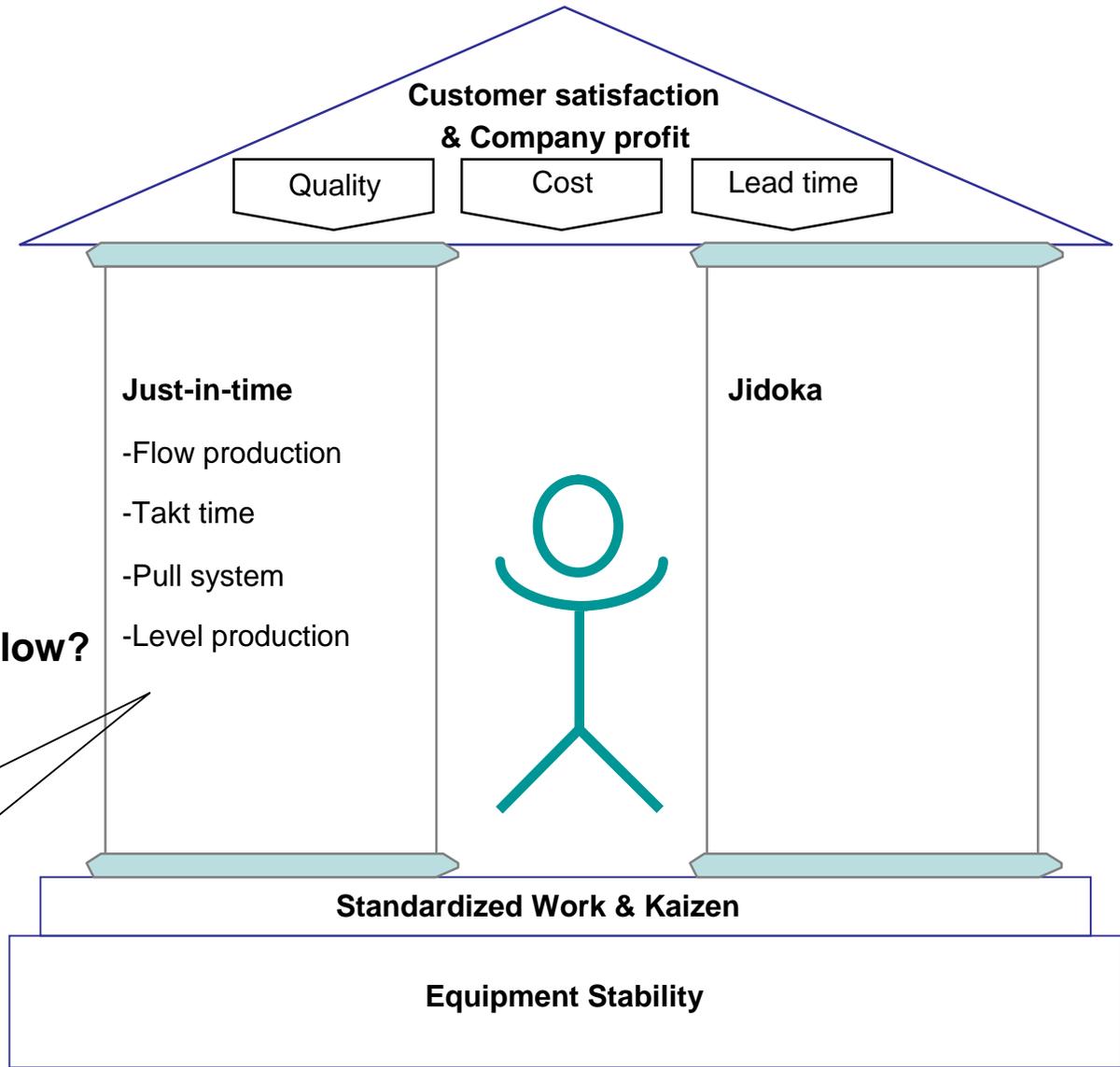1990   Introduction of TPS (i.e. lean production) to outside world by J. Womack and D. Jones

*VSM is not listed in any Toyota handbook as a major TPS tool. The tool is mainly used by a few select individuals working with suppliers and on line conversion work to emphasize material, motion, and information flow. It focuses by design on a subset of TPS and not the whole…

TPS Framework

LTS* - Map the value stream

1. **Takt time?**
2. **Continuous flow?**
3. **Pacemaker?**
4. **Supermarket pull system?**
5. **MTO/MTS?**
6. **Level production?**
7. **Pitch increment?**
8. **Process improvements for flow?**

However, most of the Lean focus in the U.S. today is on just a part of overall TPS

Customer satisfaction & Company profit

Quality | Cost | Lead time

Just-in-time

-Flow production

-Takt time

-Pull system

-Level production

Jidoka

Standardized Work & Kaizen

Equipment Stability

*LTS - Learning to See, followed by CCF - Creating Continuous Flow, MMF - Making Materials Flow, & CLP – Creating Level Pull
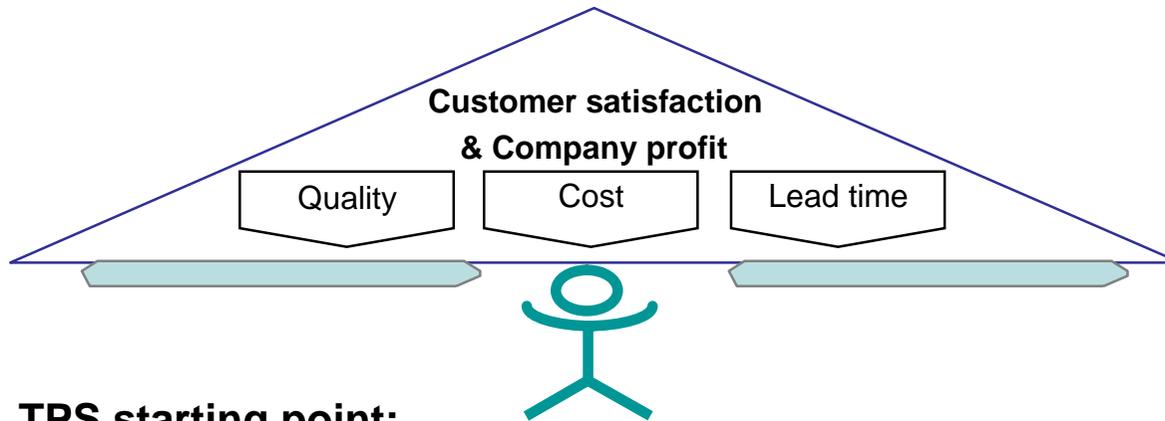
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TPS Framework – 3 Starting Perspectives

Customer satisfaction & Company profit

| Quality | Cost | Lead time |

TPS starting point:

How will you a) achieve customer satisfaction b) obtain a profit and c) develop people?

If you solve real business problems related to these three areas you'll be fine…if you just implement tools you'll probably struggle.

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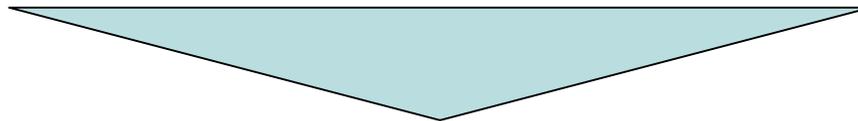
TPS Framework – Customer Satisfaction
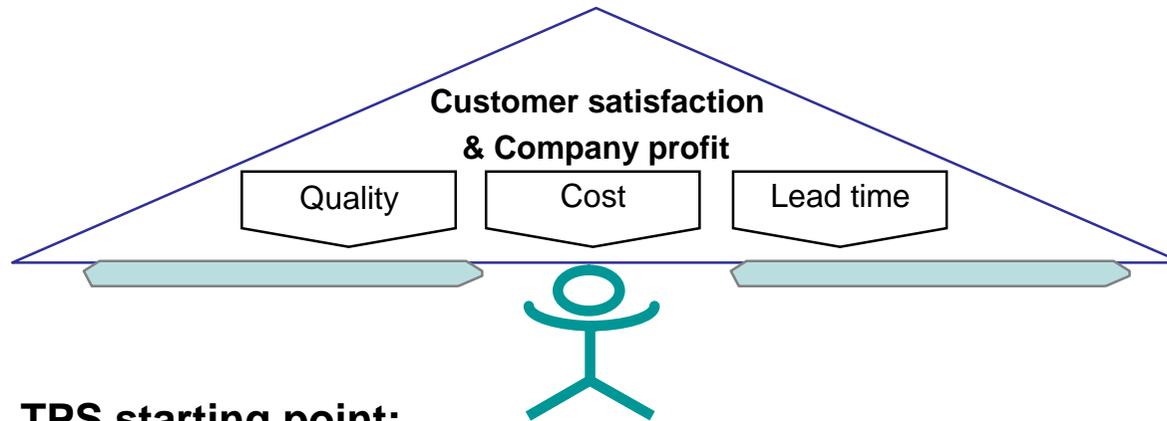
**Customer satisfaction
& Company profit**

| Quality | Cost | Lead time |

<u>**TPS starting point:**</u>

**How will you a) *achieve customer satisfaction* b) obtain a profit
and c) develop people?**

1) **Produce the highest possible <u>Quality</u>**
2) **At the lowest possible <u>Cost</u>**
3) **With the shortest possible <u>Delivery</u> lead-time**

Note: More on this later

TPS Framework – Profit Principle
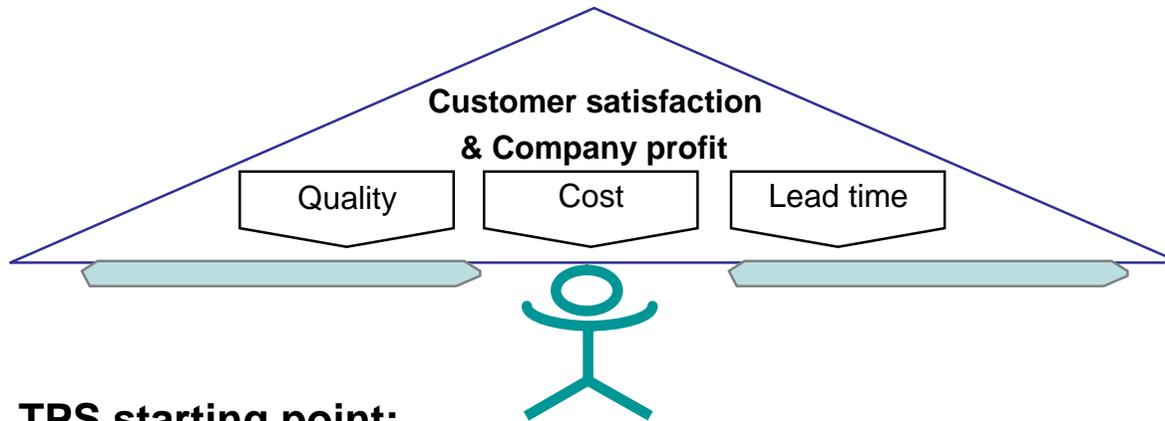
**Customer satisfaction
& Company profit**

| Quality | Cost | Lead time |

TPS starting point:

**How will you a) achieve customer satisfaction b) *obtain a profit*
and c) develop people?**

Company Circumstances

Price/
Cost

Price

Profit

Cost

Time
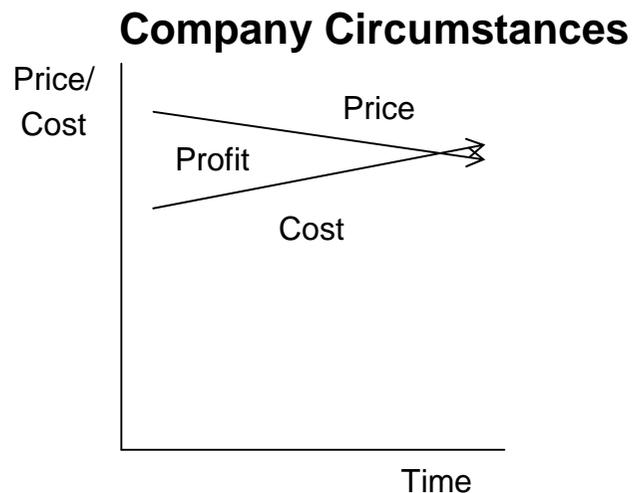
(Price – Cost) x Volume = Profit

Three options:

1) **Increase price**

2) **Increase volume**

3) **Reduce cost**

TPS primary
focus is here by
necessity

TPS Framework – Cost Reduction Principle

Customer satisfaction & Company profit

Quality   Cost   Lead time

$$

$$

Other	
Ind.	
Labor	
S/V	
O/H	
Mat'l.	

Revenue   Cost   Profit

1) The *way* you manufacture affects cost…
2) The *way* you design affects cost…
3) As does the *way* you purchase material and work with suppliers
4) People and process improvement are key to making this work

TPS (Toyota Way) recognizes these points and works equally on all dimensions!

The way you manufacture affects cost…

| Key TPS Questions	Typical Problems	Countermeasures or analysis tools
	3. How will you achieve JIT?	•On-time delivery •Inventory •Lead-time	•VS Mapping •SMED •Pull system / kanban
1. How will you satisfy the customer and obtain a profit? 2. What are your main problems in production?	4. How will you build in quality?	•Customer defects •Scrap •Rework	•Abnormality detection •Stop the machine •Address & Solve
	5. How will you stabilize processes?	•Downtime •Capital productivity •Scrap & Rework	•6 losses / OEE •SMED •Problem solving
	6. How will you standardized work?	•Labor productivity •Scrap & rework •Safety	•Job Instruction •Standardized work •Motion analysis
	7. How will you develop natural work team leaders?	•Team morale •Skills development •Small improvements	•TWI/JR •TWI/JI •TWI/JM
	8. How will you sustain and improve?	•Recurring problems •Firefighting •Poor problem solving	•PDCA •Root cause analysis •Recurrence prevention

The way you develop products affects cost…

Key TPS Questions

1. How will you identify and create key features they customer will desire?
2. How will you minimize total cost in design and development?
3. How will you produce with a shorter development lead-time?
4. How will you stabilize the product development process?
5. How will you standardized designs and still maintain critical features?
6. How will you build in quality into the design?
7. How will you develop critical skills in this department?
8. How will you identify problems, solve them and improve over time?

Key Point:

The questions are similar to TPS questions in manufacturing but of course the focus does need to change as do the tools…
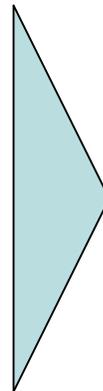
Market research
Design in concept
VA/VE/VI
Concurrent engineering
CAD/CAM development
Rapid prototyping
Tooling development
Materials research
Others…

The way you procure materials affects cost…

Key TPS Questions

1. How will you identify suppliers and create good working relationships?
2. How will you minimize total cost (not piece cost) in procurement?
3. How will you procure with a short lead-time?
4. How will you stabilize the procurement process?
5. How will you standardized the procurement process?
6. How will you measure quality, cost, delivery of the supplier?
7. How will you develop critical skills in this department?
8. How will you identify problems solve them and improve over time?

Key Point:

The questions are similar to TPS in manufacturing but of course the focus does need to change as do the tools…
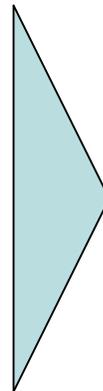
Target costing models
Long-term agreements
Supplier development center
Annual cost down targets
VE/VA workshops
Supplier scorecards
Joint development activities
Exchange of personnel

TPS Framework – 3 Starting Perspectives
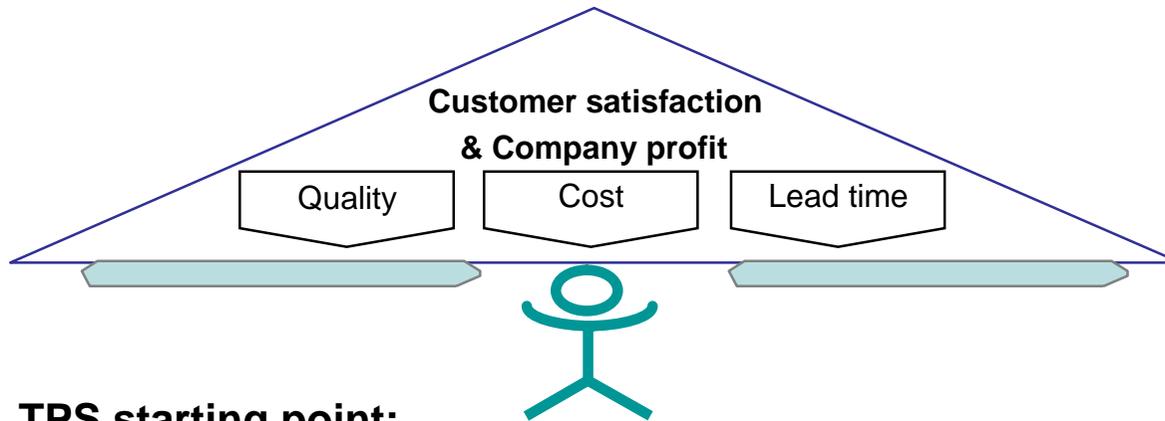
Customer satisfaction
& Company profit

| Quality | Cost | Lead time |

TPS starting point:

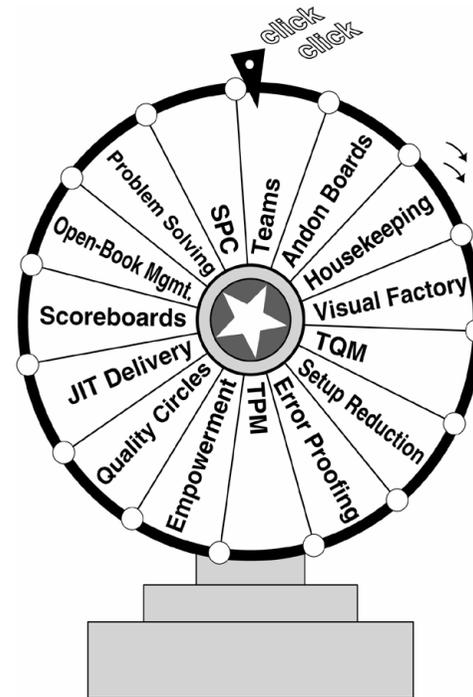**How will you a) achieve customer satisfaction b) obtain a profit and c) *develop people*?**
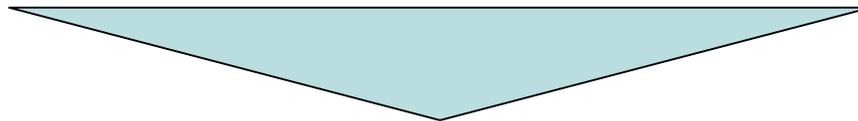
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Lean Implementation: Some Lessons Learned

Techniques ⟹ System ⟹ Thinking

- Cherry-picking the tools is not enough

- The tools comprise a system

- A way of thinking underlies the tools and system

- This "way" of thinking and acting must be transmitted to people

⟹ *Learn the thinking through doing!*

click click

Problem Solving
SPC
Teams
Andon Boards
Open-Book Mgmt.
Housekeeping
Scoreboards
Visual Factory
JIT Delivery
TQM
Quality Circles
Empowerment
TPM
Error Proofing
Setup Reduction

Next we can try......

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From "LEAN" to "LEA*R*N"

- Arguably what Toyota accomplished in its early days that has enabled it to continue to thrive is simply that it "learned to learn" better than anyone else.

- The true "DNA" of Toyota is NOT the tools that we see with our eyes but the underlying principles and paradigms that shape and drive management thinking

Lean Learning

What do we know about how people learn?

People learn:

- Through experience
- Through mistakes
- Through trail and error
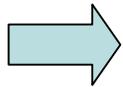
 Build structured opportunities for people to learn the way they learn most naturally.

Summary Points

- Don't dogmatically follow any set of answers or prescriptive approaches (including my workbook, John Shook's or anything from LEI). The T in TPS stands more correctly for "Thinking" and not "Template". You can't just copy what TPS is or any of the tools are…your business is sometimes quite different.

- Start with the three basic points of a) How will we improve customer satisfaction, b) How will we improve profits, and c) How will we develop people? As a starter go back to my suggested sets of questions - I guarantee you'll go farther and cover more ground in the long run.

- If something seems "too hard" or "illogical" then it probably is. Always question the assumptions and reasons why are doing something…but of course don't let this stop you from learning by doing.

- Never put the solution or tool in front of the problem…follow the scientific method and you'll come out better in the long run (Mr. Ohno's advice - not mine!)