Lean is loved by everyone……

Lean Manufacturing Systems

Lean Thinking

Lean Management

Toyota Production Systems (TPS)

Management tool for Operational Excellence

Economic conditions.....

Before .....

Price = Cost + Profit

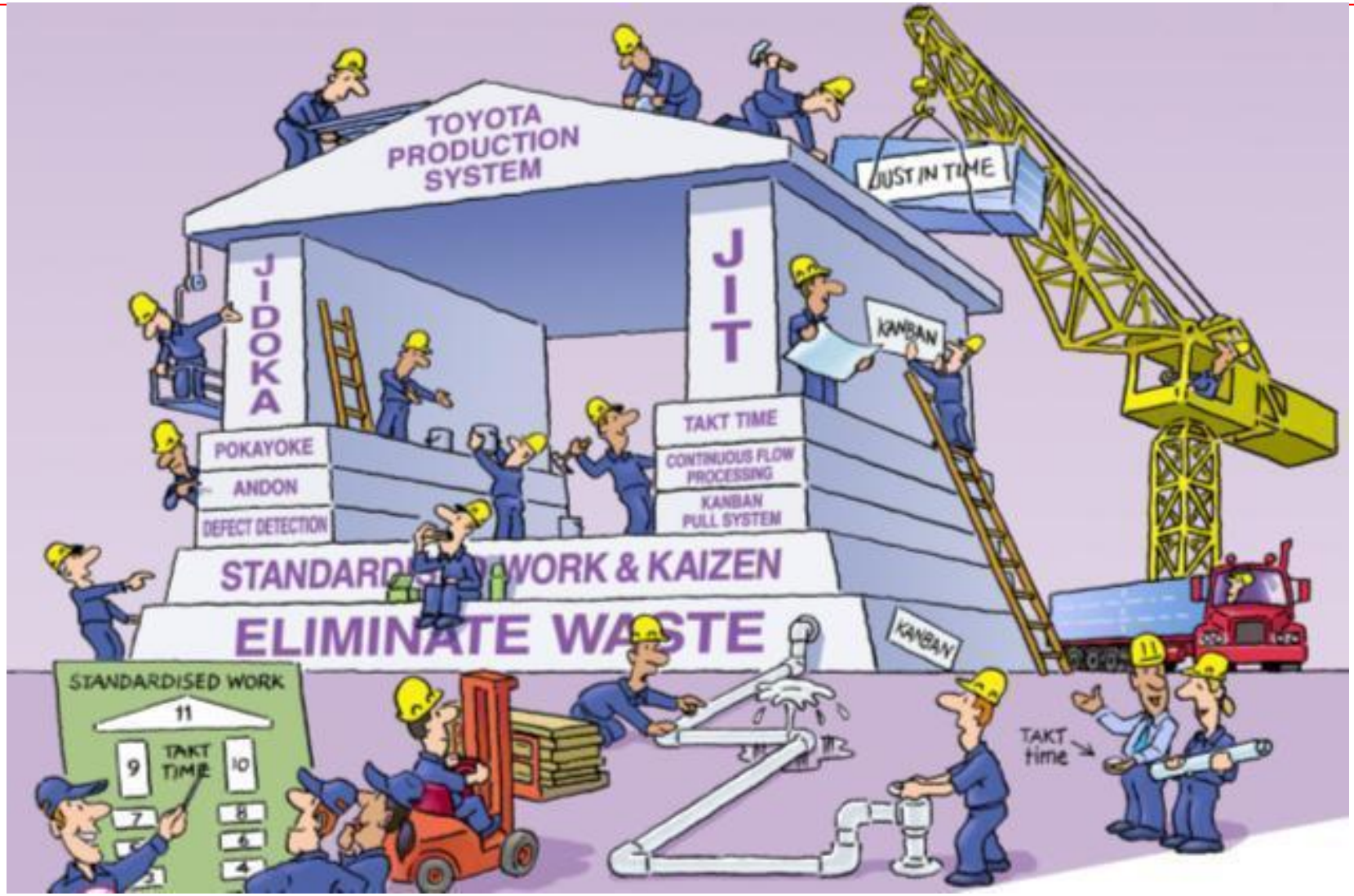
Profit = Price – cost

Today .....

Profit = Price(VA) – Waste (NVA)

The challege is to eliminate NVA activities

Lean Manufacturing



Lean Production : TPS

History & Background ……..

Started as Toyota Production System - Toyoda Motor Car Company

Manufacturing of looms,bicycles,engines,small delivery vehicles,trucks & finally cars before WWII.

Poor management – almost bankruptcy

Henry Ford – Assembly line concept
F.W.Taylor - Scientific management
Dr.W.Edwards Deming – Modern Quality Management
– Constancy of purpose

Toyota created a suspense story by Cheaper vehicles – 1970

Manufacture a car in Japan, ship it to North America, and sell it faster and cheaper than domestically made vehicles with Huge import restrictions
Quality of vehicles increased rapidly – reliability & longevity on the road

History & Background ……..

Japanese vehicles innovated at rapid rate

Research project to analyze the world-wide automotive industry in 14 countries

"The Machine that Changed the world – Dr. Womack

Americans/Europeans accepted the mass production theory and honed it to perfection

Toyota used mass production as a starting point & evolved it further into TPS. Toyota borrowed heavily from Henry Ford's principles of 1930s. Ford's book was a best seller in Japan though forgotten in US

Phrase coined "Lean Manufacturing" by Womack

Phrase coined "Lean Thinking" – usefulness in Banks, Service organizations, Hospitals and all manner of business systems

History & Background ……..

Lean Manufacturing is applied at the point of contact with customer as well as back room work

It applies to Engineering & Design office as well as traffic flow in urban centres.

It takes a smart person at least 20 years to complete full training, attitude, knowledge & comprehension of LM in the work venue.

Most significant savings can be achieved in first 9 months. These can be …..

- 93% reduction in Lead-time (12 days to 6.5 hours)
- 83% reduction in WIP inventory (from to 1.5 hours)
- 91% reduction in FG inventory (from 30000 pcs to 2900 pcs)
- 50% reduction in Overtime
- 83% improvement in productivity (from 2.4 to 4.5 pcs /labor hour)

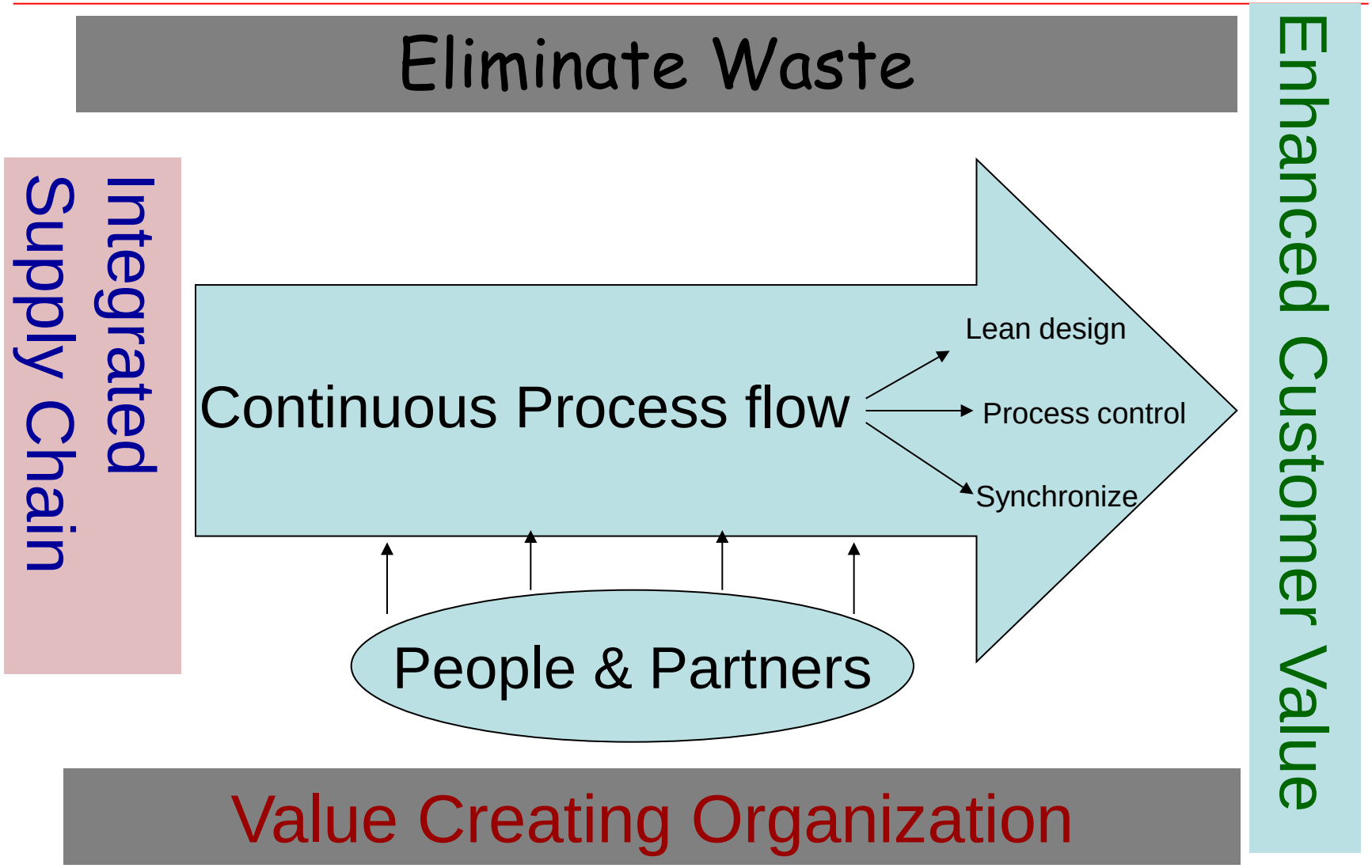
Lean systems ……..

- Reduces the time between a customer order and delivery by eliminating non-value added waste

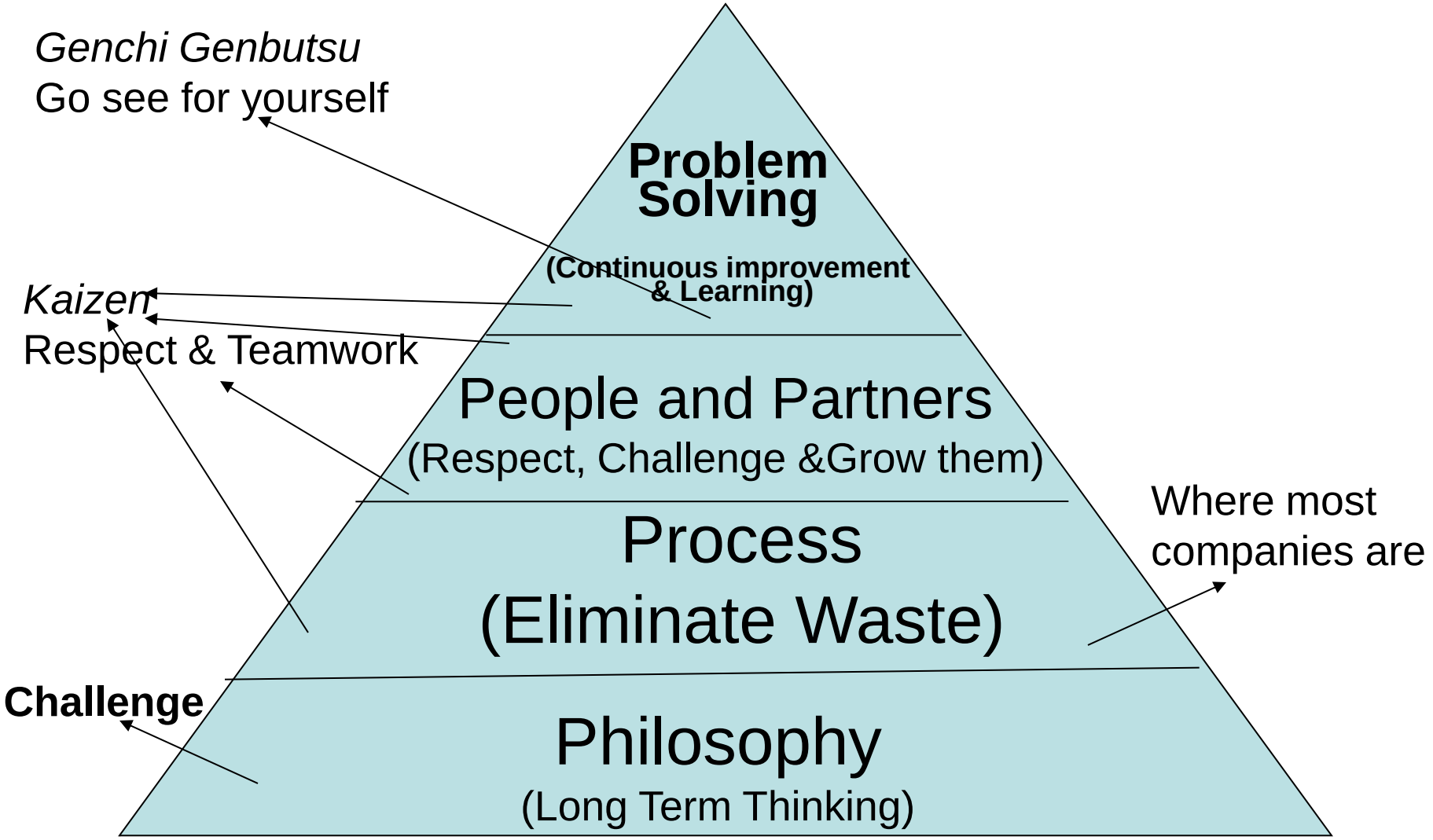
- Value added worker "ä surgeon"

- SMED (Single minute exch of dies) – smaller batch
- Supplier involvement at Design stage
- Develop individuals with capacity to learn continuously
- Contribute to society – TATA & Reliance, Infosys/TCS & Wipro

Lean Manufacturing



4 “P” model


Genchi Genbutsu
Go see for yourself
Problem Solving
(Continuous improvement & Learning)
Kaizen
Respect & Teamwork
People and Partners
(Respect, Challenge &Grow them)
Process
(Eliminate Waste)
Where most companies are
Challenge
Philosophy
(Long Term Thinking)

4 “P” Philosophy

Philosophy

- Company is a vehicle to add Value to
- Customers, society, community & associates

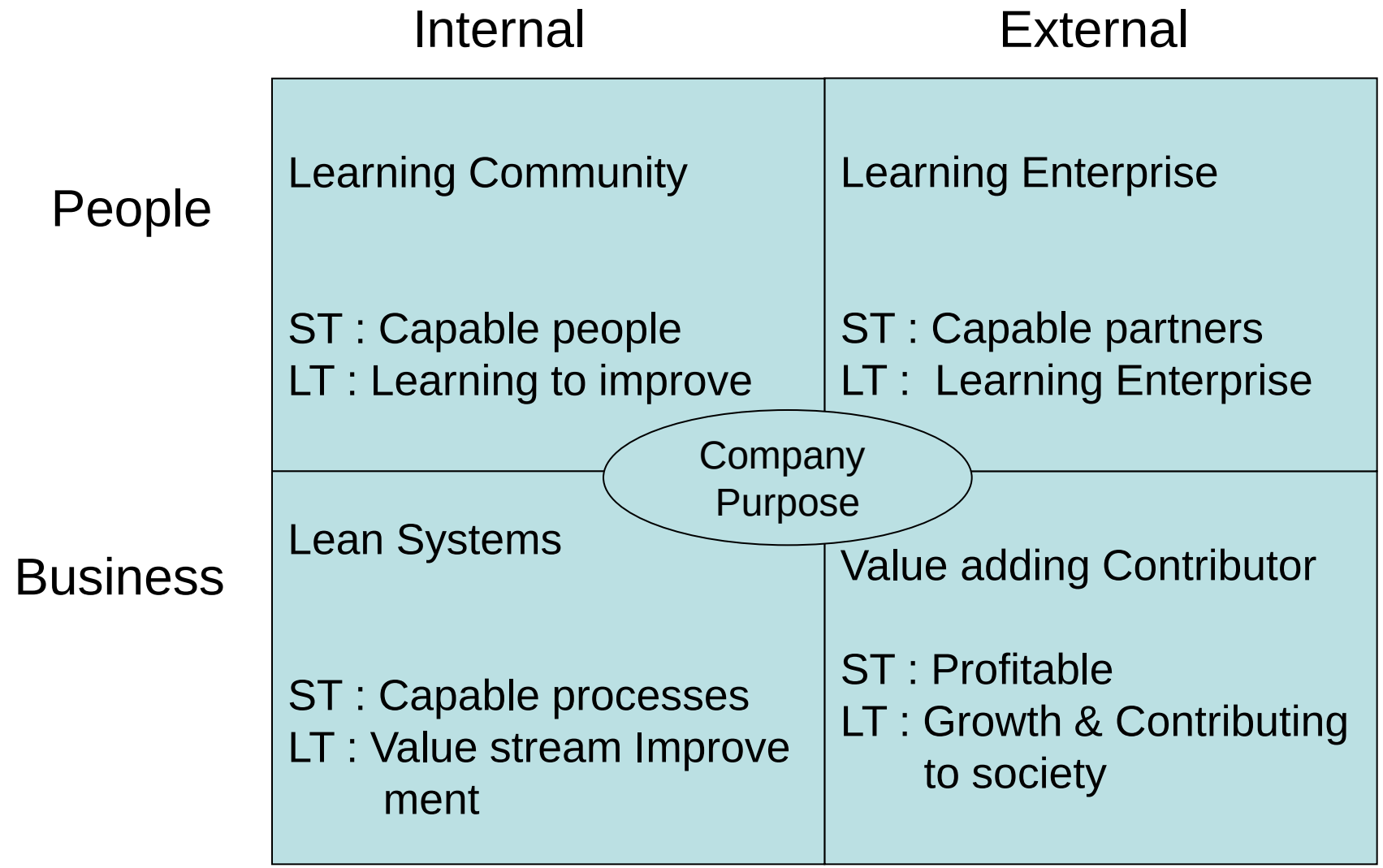
Process

- Right process will produce right results
- Learn thro’ mentorship & experience
- Bringing parts to assly line every hour???
  - Creates flow and reduce inventory
- Spending time on developing consensus ??

4 “P” Philosophy

- People & Partners
  - Challenging people & partners to grow
  - Respect for humanity system
  - Create challenging environment
  - Suppliers are partners
- Problem solving
  - Continuously solve root problems to drive organisational learning
  - Achive flawless objectives
  - Tortoise and not hare
  - Develop a learning organisation, Learn & share

Defining Company purpose



Truck chassis assembly line

1. Delivering components to the assly line
2. Walking 20 feet to pick up the component
3. Picking up bolts for the components
4. Walking 25 feet back to the chassis on the assly
5. **Positioning the component on the chassis**
6. Walking to the power tool
7. Reaching to the power tool
8. Pulling the power tool to the component
9. **Placing the bolts in the component**
10. **Tightening the bolts to the chassis with the power tool**
11. Walking back 25 feet for the next component

Waste in assly line

Value added activities

Non-value adding waste… *Muda*

1. ***Overproduction***

   Without orders, just to keep machine/manpower busy

2. ***Waiting (Time on hand)***

   Lot processing delays,equip.downtime,tool to arrive

3. ***Unnecessary transport or conveyance***

   Carrying wip long distances,inefficient transport

4. ***Overprocessing or incorrect processing***

   Inefficient tool, higher quality than needed

5. ***Excess inventory***

   Excess RM,WIP,FG – obsolescence,storage cost, delays

Non-value adding waste… *Muda*

6. ***Unnecessary movement***

   Wasted motion performed – reaching for parts,stacking,

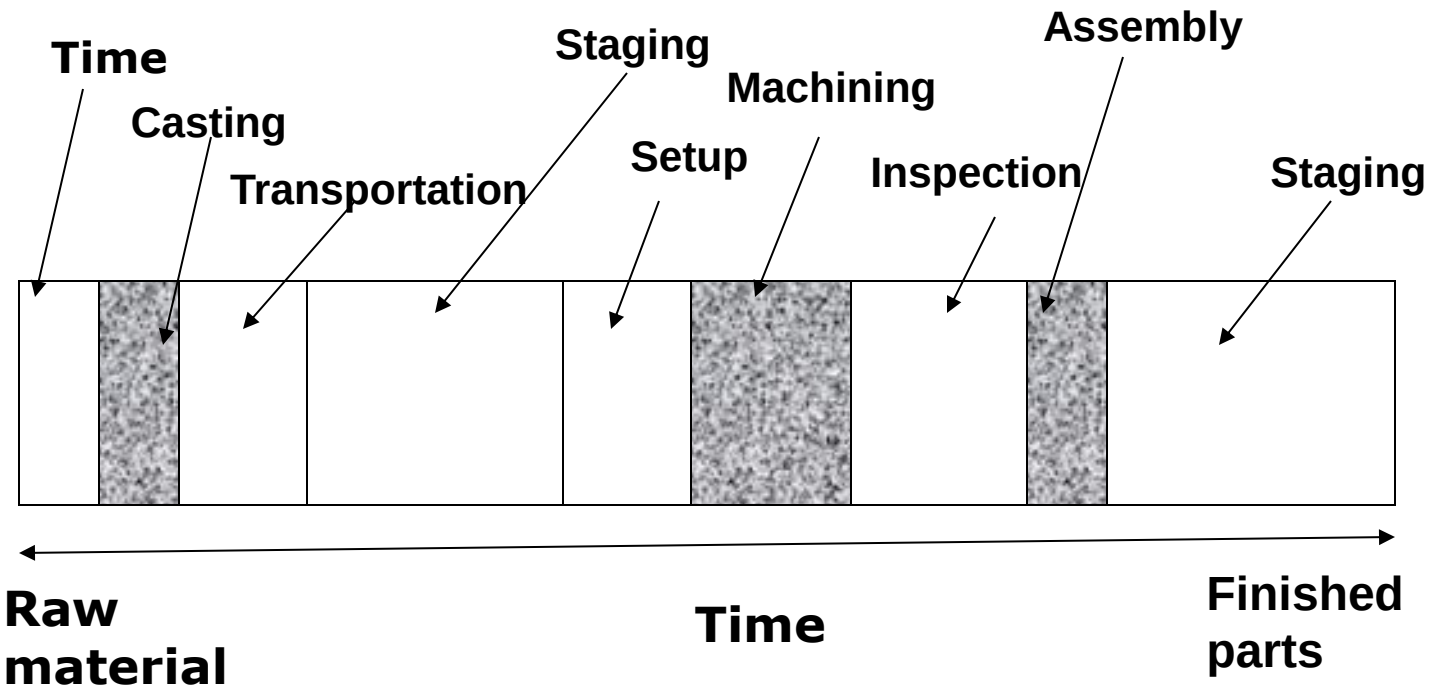
7. ***Defects***

   Prodn of defective parts, Inspection means wasteful handling time and efforts

8. ***Unused employee creativity***

   Loosing time, ideas, skills, improvements & learning opportunities by not listening to your employees

Waste in a value system



Value added time

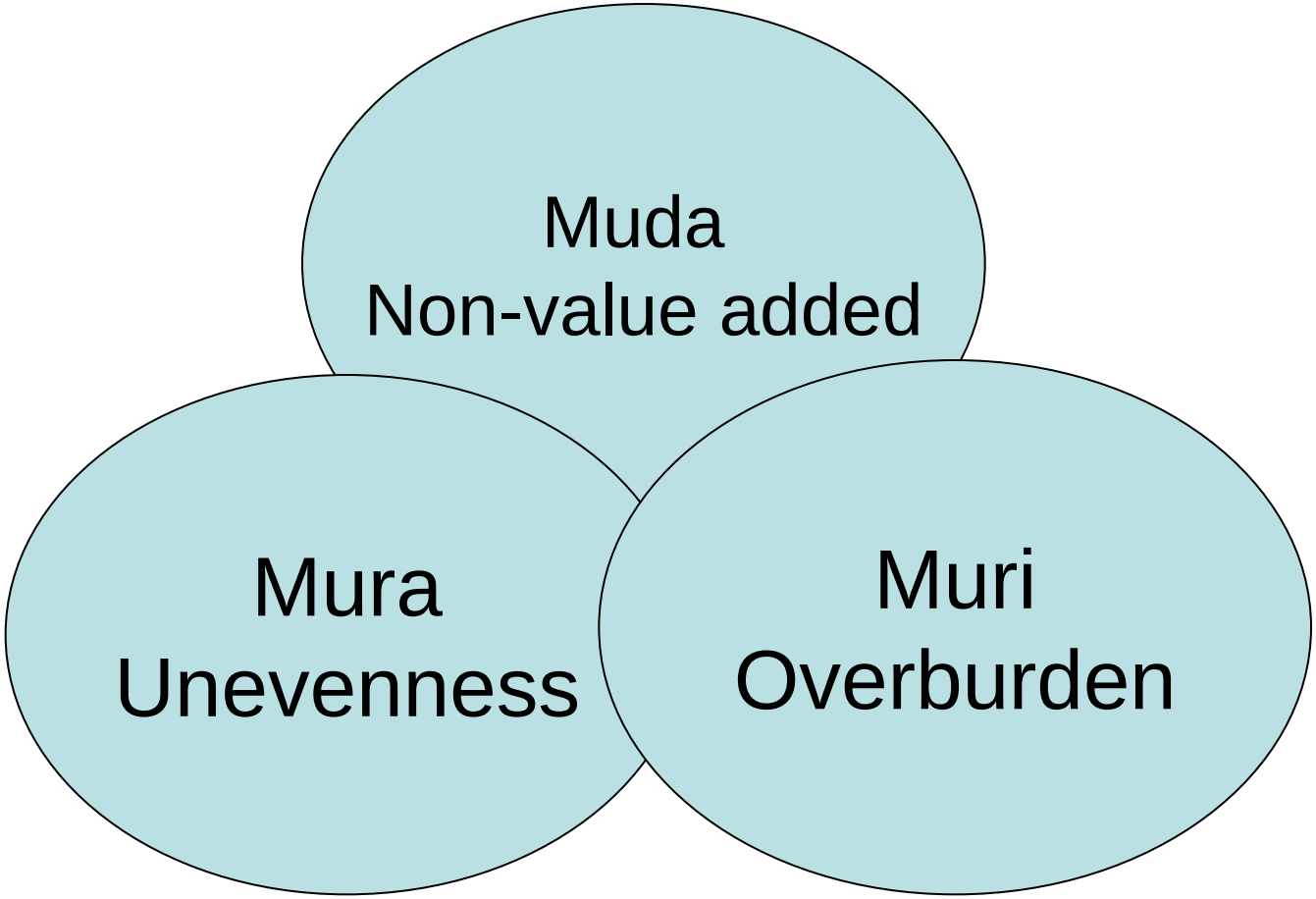
Non-Value added time

Value added time is only a small % of the total time

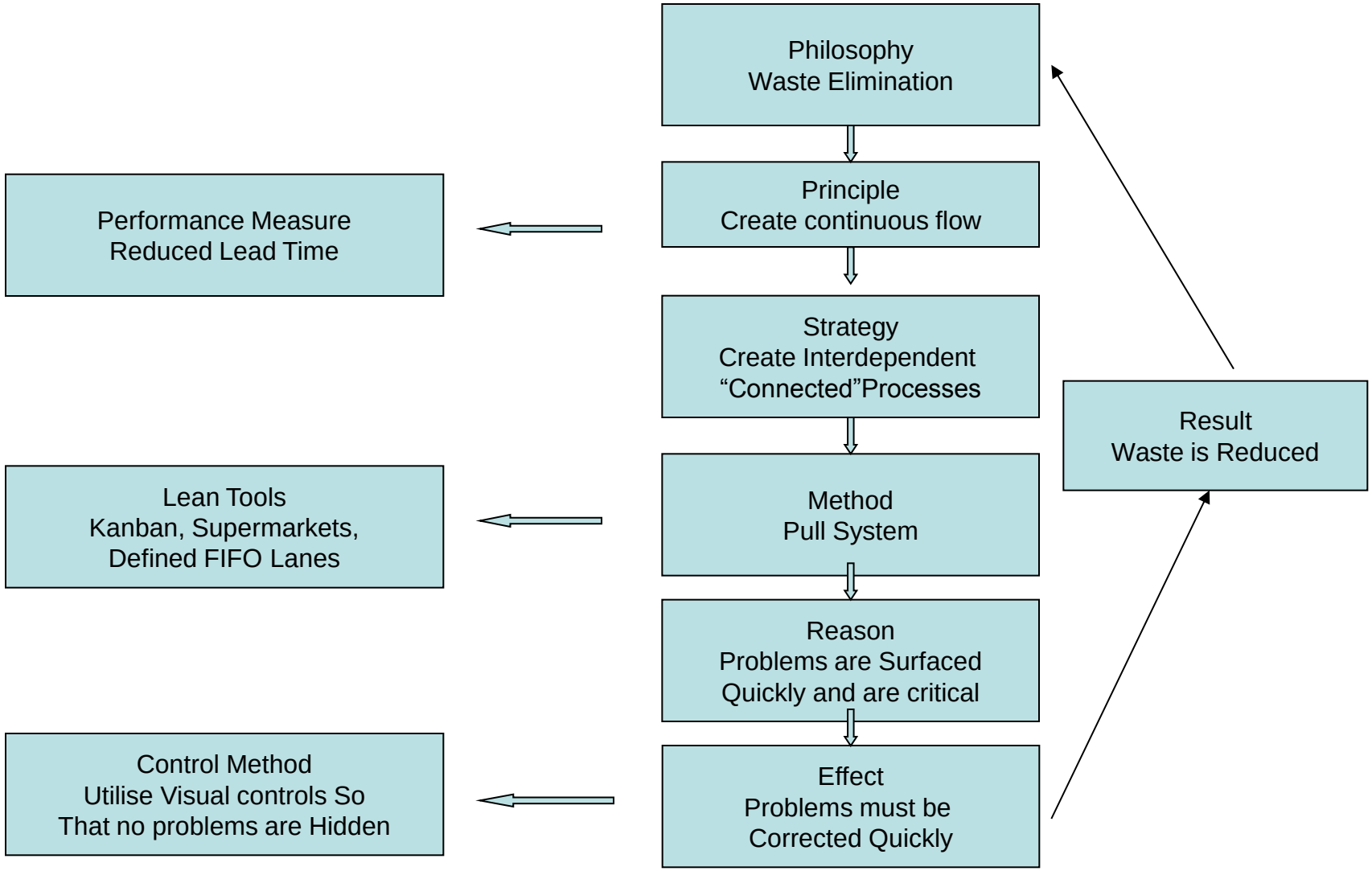
Traditional cost savings focuses only on Value adding items

Lean thinking focusses on the value stream to eliminate non-value-adding items

The three “M’s



Waste Reduction model…



Lean Principles ……

I. Long Term Philosophy

Base your management decisions on a long-term philosophy, even at the cost of short-term financial goals

Carry thro' organisation toward a common purpose that is bigger than making money

Generate value for customer, society & the economy

Be responsible – U have to produce added value

Every executive understands his place in the history of the company

Lean Principles ……

II. Right process will produce the Right Results

- Create continuous process flow to bring problems to the surface
  - Redesign work processes to achieve high VA,continuous flow. Strive to cut back idle sitting time
  - Link processes & People together so that problems surface out
  - Make flow evident throughout
- Use “Pull” systems to avoid overproduction
  - Provide customers what they want,when and in the qty they want. Material replenishment initiated by consumption – Just-in-time.

Lean Principles ……

Be responsive to day-to-day shifts in customer demand rather than computer shedules.

•Level out the workload (heijunka) – Work like Tortoise, not the hare
Eleminate waste – overburden to people & equipment and
Eliminate unevenness in the production - do not work in batches

•Build a culture of stopping to fix problems, to get quality right the first time
•Quality for the customer drives your value proposition
•Machines with human touch

Lean Principles ……

- Standardized tasks are the foundation for continuous improvement and employee empowerment
- Use visual control so no problems are hidden – Not computer screens – Simple one page reports
- Use only reliable, thoroughly tested technology that serves your people and processes

III. Add Value to the organization by Developing your People and Partners

- Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others
- Develop exceptional people and teams who follow your company's philosophy

Lean Principles ……

- Respect your extended network of partners and suppliers by challenging them and helping them improve

IV. Continuously Solving Root Problems Drives Organizational Learning

- Go and see for yourself to thoroughly understand the situation (*genchi genbutsu*)
- Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly
- Become a learning organization through relentless reflection (*hensei*) and continuous improvement (*kaizen*)

Batch processing

Computer making in three depts.

1. Computer bases
2. Computer monitor
3. Computer test dept.

Each dept. takes One minute per unit means 10 min. to complete the batch and move to next dept.

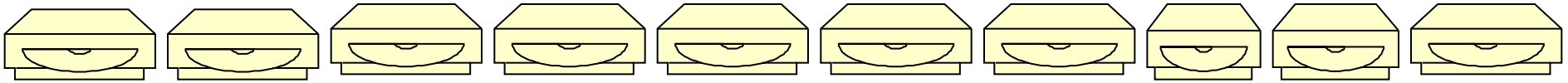
It will take 30 min to make and test first batch of 10 units to customer

It will take 21 minutes to take out 1st computer ready to ship

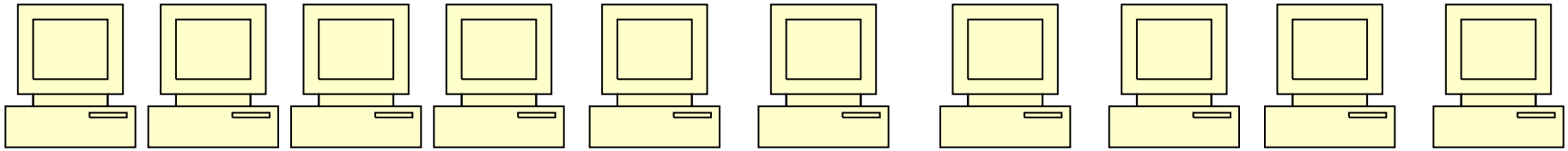
Only 3 minutes of value added work are needed to complete that computer

There are 21 sub assemblies in process at a time

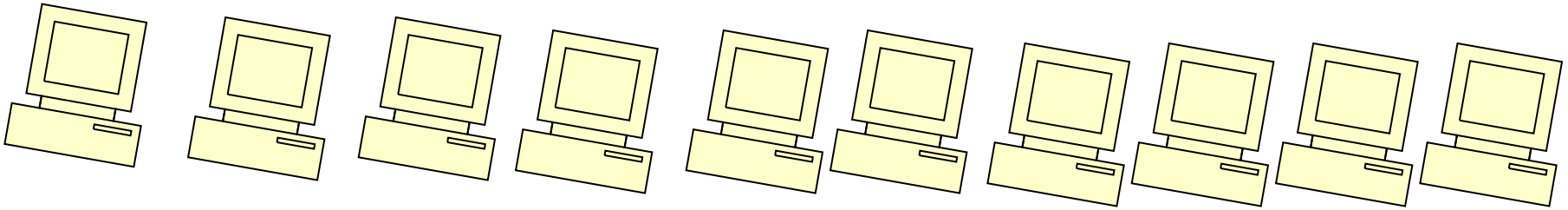
Batch processing Example



Computer base department

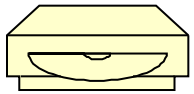


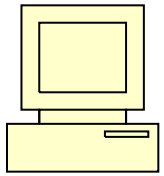
Computer monitor department

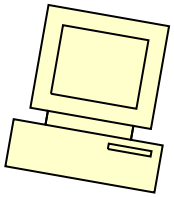


Computer test department

Continuous flow example







Product takes three processes that Take one min each (One piece flow Production cell)

- First part ready in 3 min
- 10 completed in 12 min
- Only 2 sub-assemblies in process at a time

Continuum of flow……

Traditional Batch & Queue — Ideal State of Lean

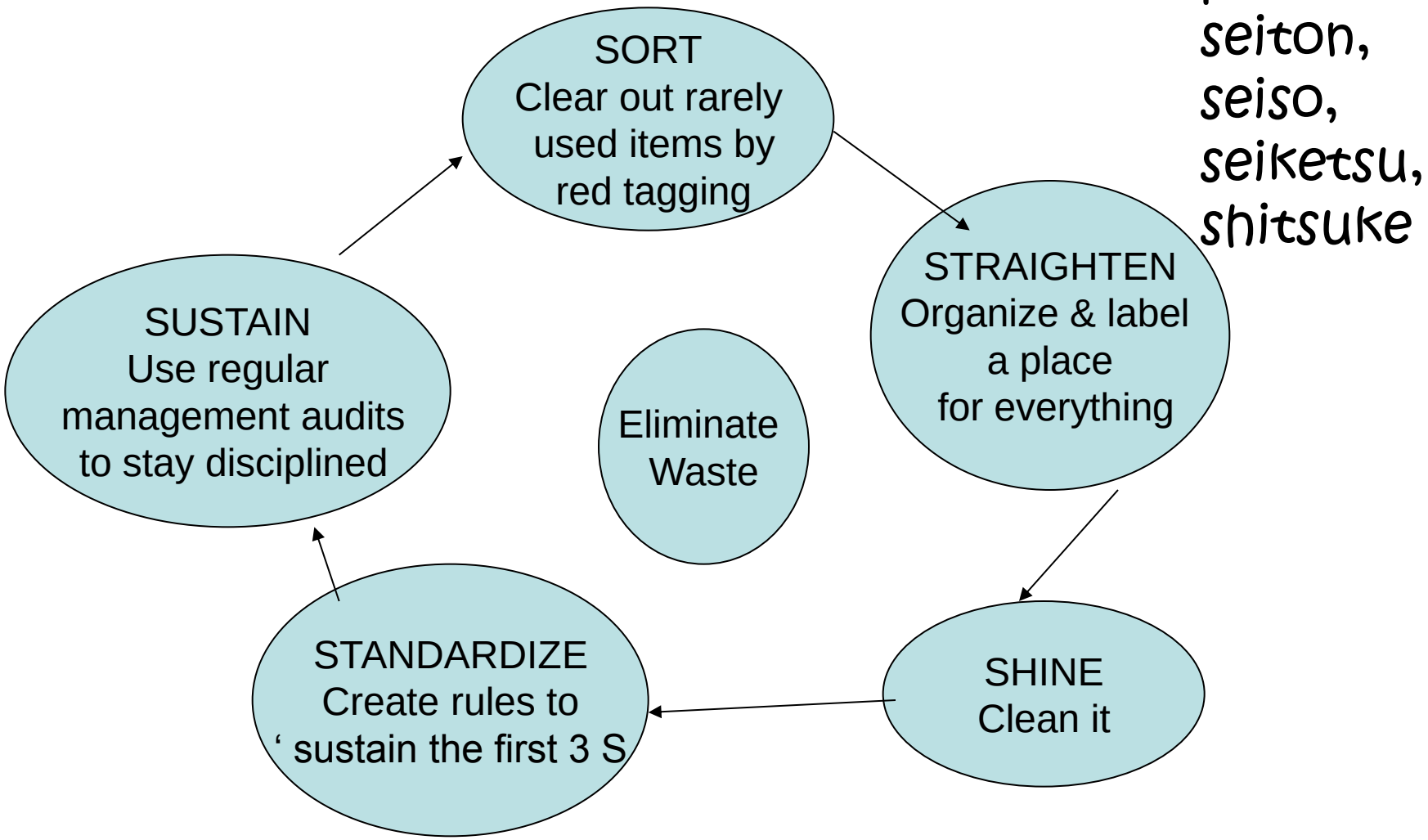
Push Or <u>Scheduled</u>	**Supermarket Pull <u>(Kanban)</u>**	**Sequenced Pull <u>(Broadcast)</u>**	**FIFO Sequenced <u>Flow</u>**	**Continuous Flow <u>(1 pc flow)</u>**
Schedule Each Process & Push to the Next	Upstream Process Replenishes What down Stream Customer Took away	Pull from a Feeder in sequence	Defined Lane With defined Standard WIP Between unlinked Processes in FIFO sequence	Physically link Process Steps with No Inventory between

Tortoise story……

The slower but consistent tortoise causes less waste and is much more desirable than the speedy hare that races ahead and then stops occasionally to doze. The TPS can be realized only when all the workers become tortoises

….Ohno 1988

The 5 “S” Concept



The 5 “S” Concept

The five S’s together create a continuous process for improving the work environment

Start by sorting thro what is needed everyday to perform value-added work from what is seldom or never used

Mark the rarely used items with red tag and move them out of work area

Create permanent locations for each part or tool in the order of how much it is needed to support operator as if he were a *Surgeon*

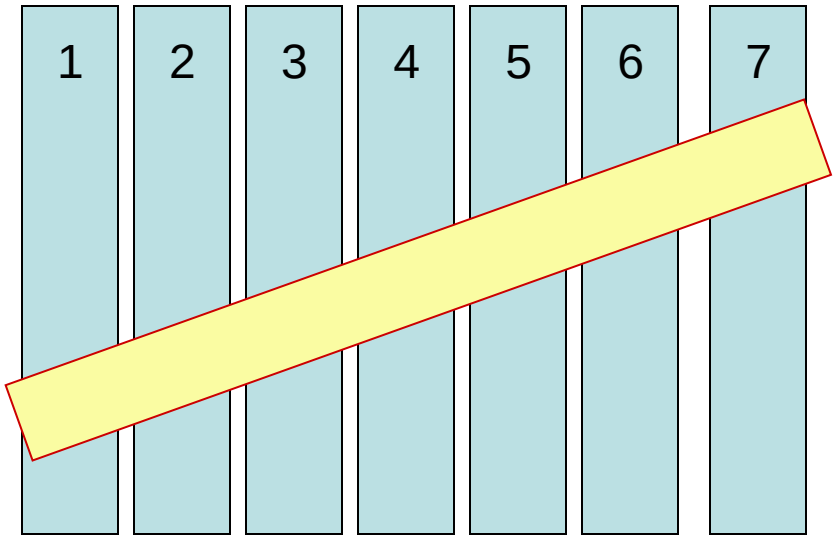
Shine,clean to act as a form of inspection that exposes abnormal and prefailure conditions that could hurt quality,safety or machine failure.

The 5 “S” Concept

Standardize to maintain and monitor the first three pillers of 5 “S”

Sustain – Maintaining a stabilized workplace is an ongoing process of continuous improvement

5 “S” - Filing system



Kaizen - Continuous improvement

Promises big rewards through continuous incremental change.
A means of continuing improvement in personal life, home life, social life, and working life.

At the workplace, Kaizen means continuing improvement involving everyone—managers and workers alike.

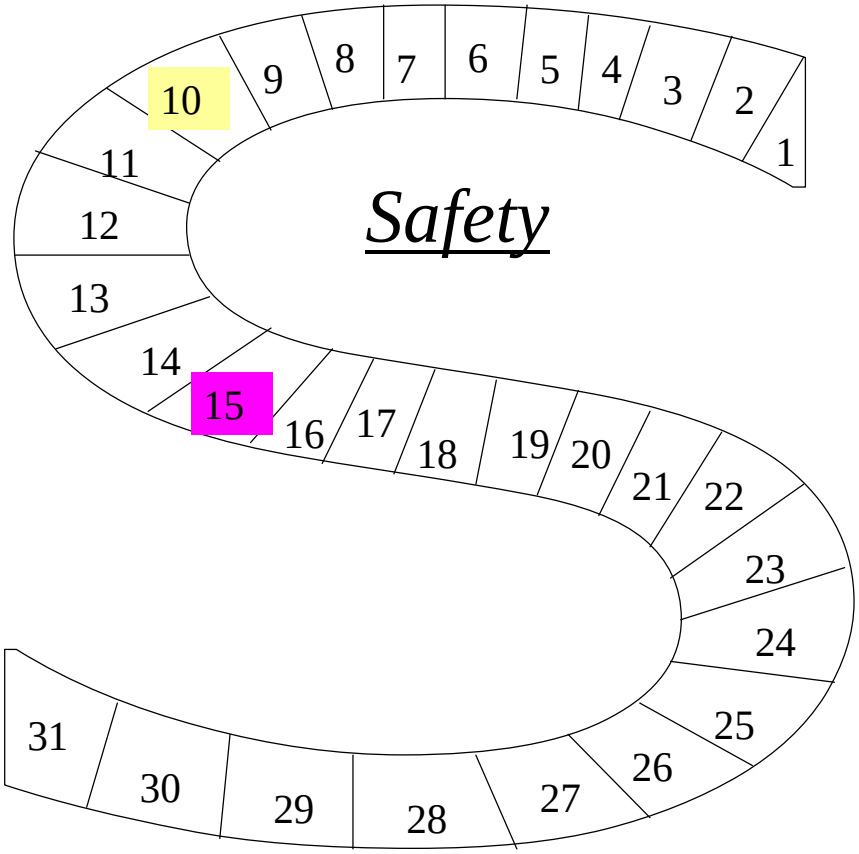
The Kaizen business strategy involves everyone in an organization working together to make improvements without large capital investments.

Kaizen ….. How to plan

- Start by motivating a class of operators to improve somewhere in their work area
- Reward them in open
- Let them share their experience in an open meeting
- Involve supervisors to guide operators
- Introduce formal scheme – only for operators
- Reward only for implemented kaizens
- Kaizen workshops for operators and Supervisors separately
- Supervisors performance appraisal include no. of kaizens developed
- Kaizen Milestone awards
- Recognition at highest level – calling with family for a dinner

Kaizen - Continuous improvement

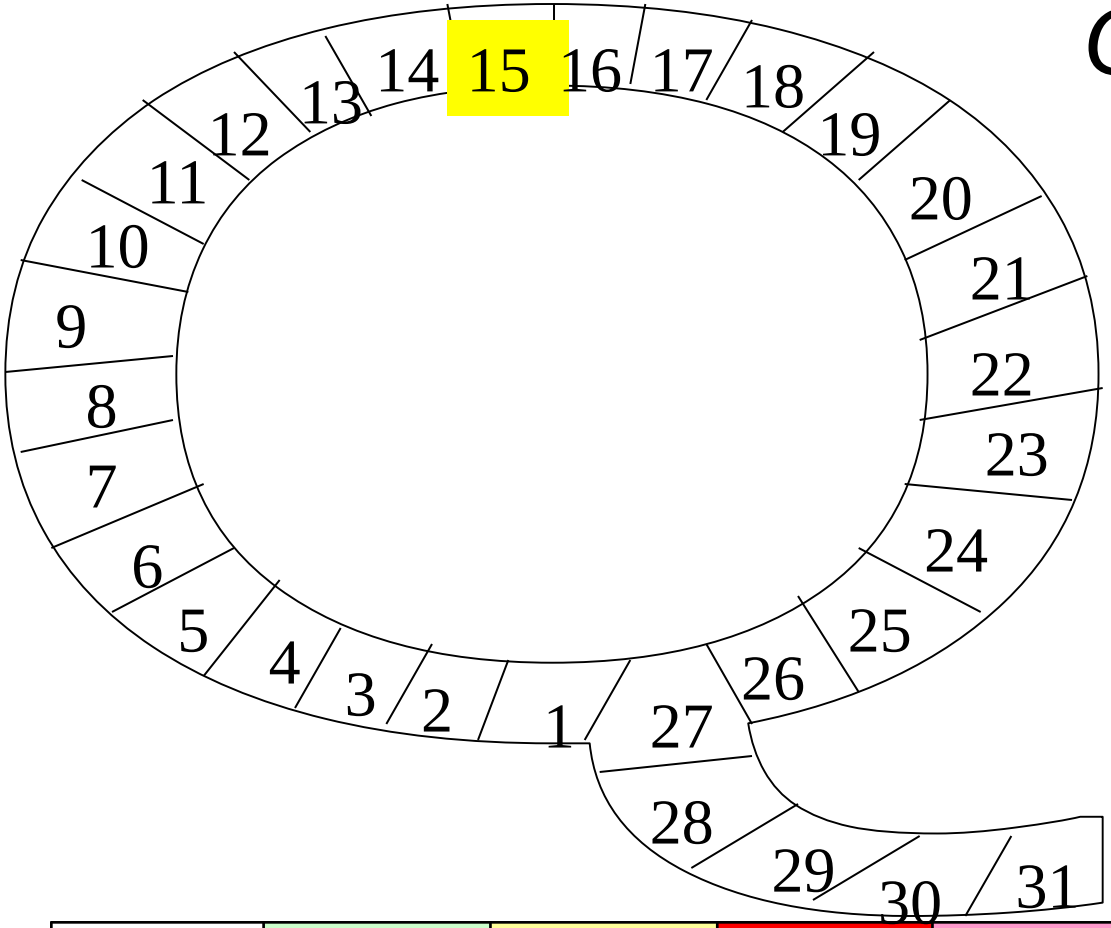
Visual Management



Colour Code	No Accident	Minor Accident	Under Training	Major Accident

Visual Management

Quality



Colour Code	No Defect	Up to 2 Defect	3 & > Defect	Under Training

Genchi Genbutsu.....

Improvement can occur only when a process is stable and standardized

Get to the root cause by asking “Why” 5 times

Develop Kaizens though a systematic process

- Who is the customer
- Current state map
- Future state map
- Implementation plan
- Do it
- Evaluate -- Reward & motivate

Genchi Genbutsu.....

Go and see for yourself to thoroughly understand the Situation

It is unacceptable to take anything for granted or to rely on the reports of others

Your observation is always different from others

Go for first hand information

Genchi Genbutsu.....

Observe the workfloor without preconceptions and with a blank mind.

Repeat "Why"five times to every matter

Deeply understanding and reporting what you see

Watch and think for yourself

Genchi Genbutsu.....

Think and speak based on personally verified data

See America then design for America

Kanban.....

A system of replenishment – Pull system with some inventory

To know that certain parts are required in a huge factory on each station signals are required like Cards, Empty bins,Empty carts – these are called Kanban

Send back an empty bin – a kanban – it is a signal to fill it with a specific no. of parts or send a card to refill specific part.

Part of Just-in-time production

Petrol filling for your car …. Kanban

Most effective to control office stationery, canteen supplies etc.

Building your own Lean Learning organization

Start with selection of right People – Average but committed

Training on specific skills

Multiskilling – Certification system with rewards

Operator given charge of Equipment

Clean,operate and maintain

Involvement in Planning – morning meeting (DOM)

Visual management

ppm & flag system on quality

Building your own Lean Learning organization

- Visual management
  - Major machine failure boards
  - Performance board with ppm
  - Quality meetings
- Sharing the performance – involvement
- Annual appraisals – simple and objective
- 5 S Competitions and awards
- Kaizen scheme, awards and Milestones
  - Kaizen gallery
- Celebrate each small achievement
- Kanban
- Customer orientation

Questions?

Thank you