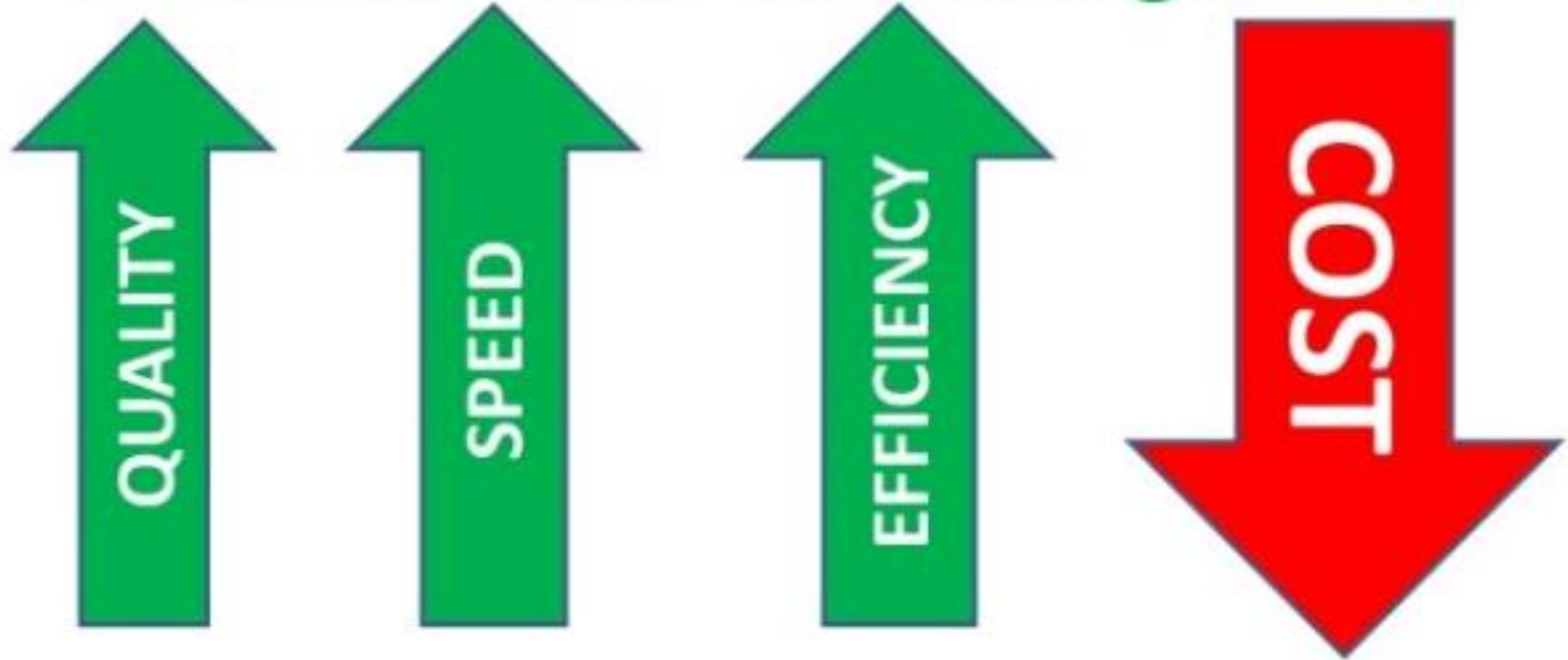


# LEAN Management



## Lean Management: Principles, Tools, and Techniques



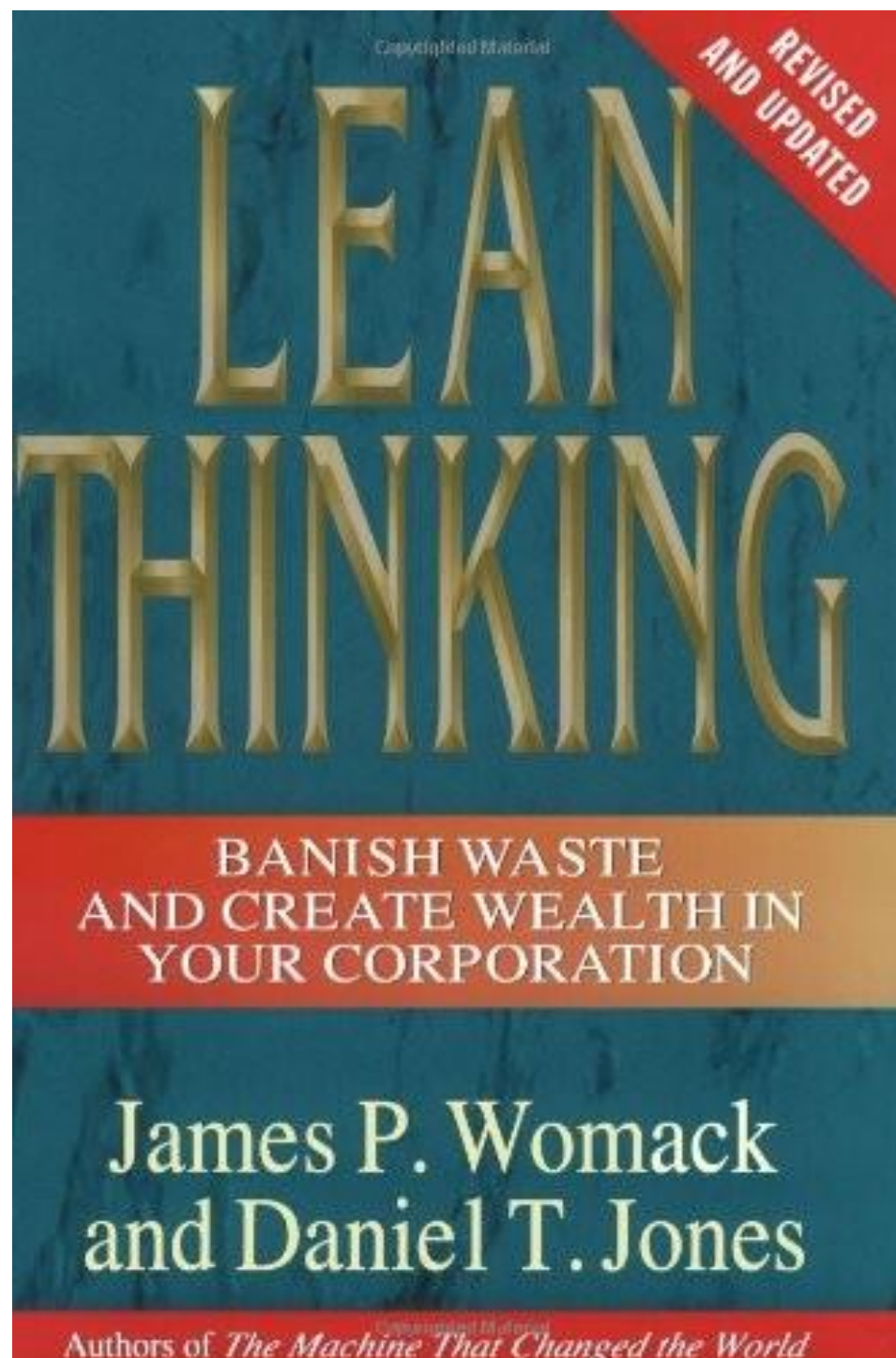
**Lean is a process of eliminating waste with the goal of creating value for enterprise stakeholders.**

“Toyota Motor Corporation's vehicle production system is a way of making things that is sometimes referred to as a "lean manufacturing system," or a "Just-in-Time (JIT) system”

**The Toyota Production System (TPS) was established based on two concepts:**

"**Jidoka**" (which can be loosely translated as "automation with a human touch"), as when a problem occurs, the equipment stops immediately, preventing defective products from being produced; and

"**Just-in-Time**" concept, in which each process produces only what is needed for the next process in a continuous flow.



## ***Five Fundamental Principles Of Lean (James Womack & Daniel Jones, Lean Thinking):***

***I. Specify value:*** Value is defined by customer in terms of specific products & services

***II. Identify the value stream:*** Map out all end-to-end linked actions, processes and functions necessary for transforming inputs to outputs to identify and eliminate waste

***III. Make value flow continuously:*** Having eliminated waste, make remaining value-creating steps flow

***IV. Let customers pull value:*** Customer pull cascades all the way back to the lowest level supplier, enabling just-in-time production

***V. Pursue perfection:*** Pursue continuous process of improvement striving for perfection

**25 Essential Tools/  
Techniques/ Principles /  
Methodologies of Lean**



## Meaning of 5S

**Seiri 整理:** Organization

**Seiton 整顿:** Orderliness

**Seisou 清掃:** Cleanliness

**Seiketsu 清潔:** Standardized Cleanup

**Shitsuke 躰:** Discipline

Reference:

5 Pillars of the Visual Workplace, Hirano, Hiroyuki (1995)

TQM for better Future 

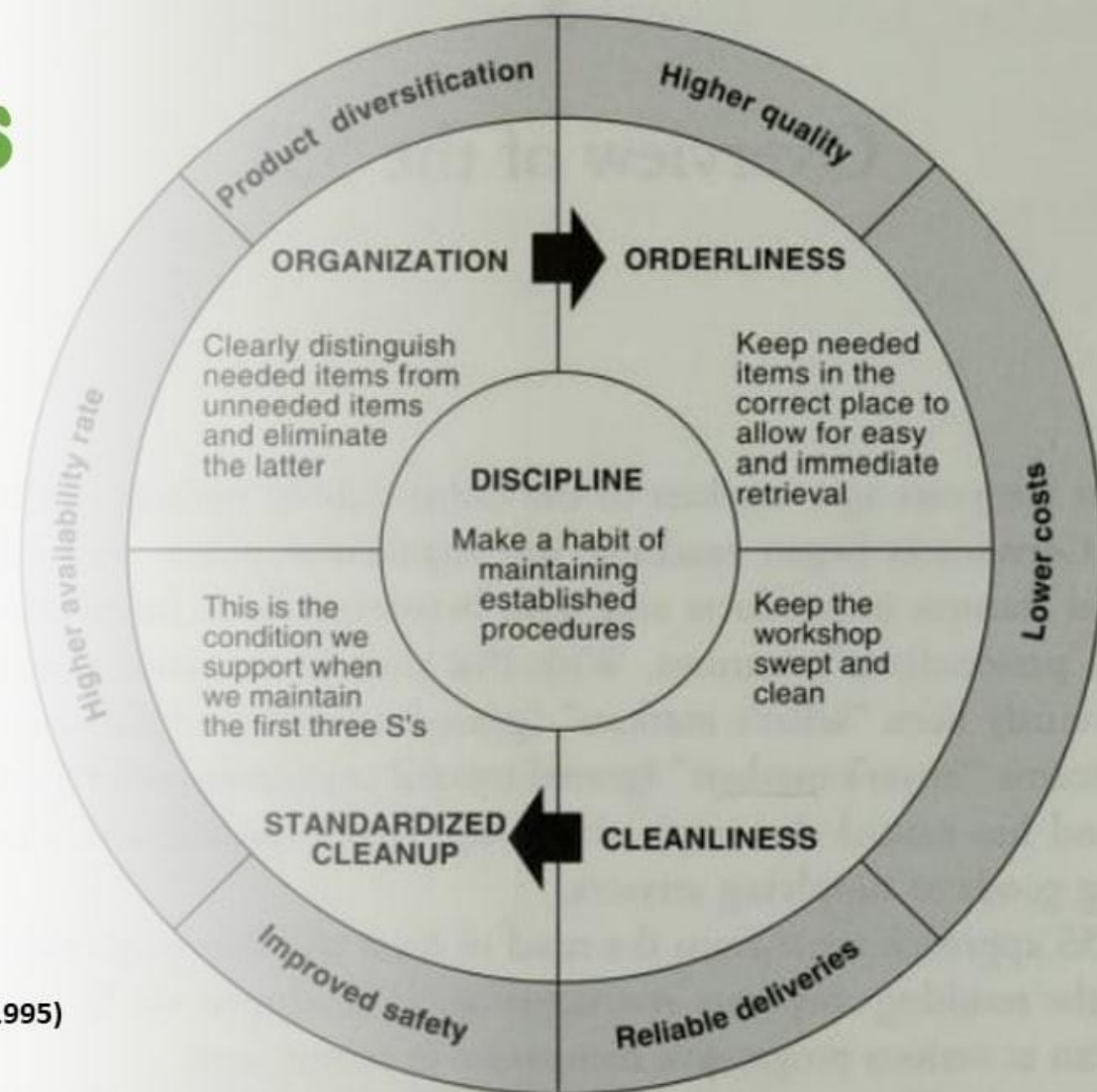


Figure 3-1. Meaning of the 5S's

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## What is 5S?

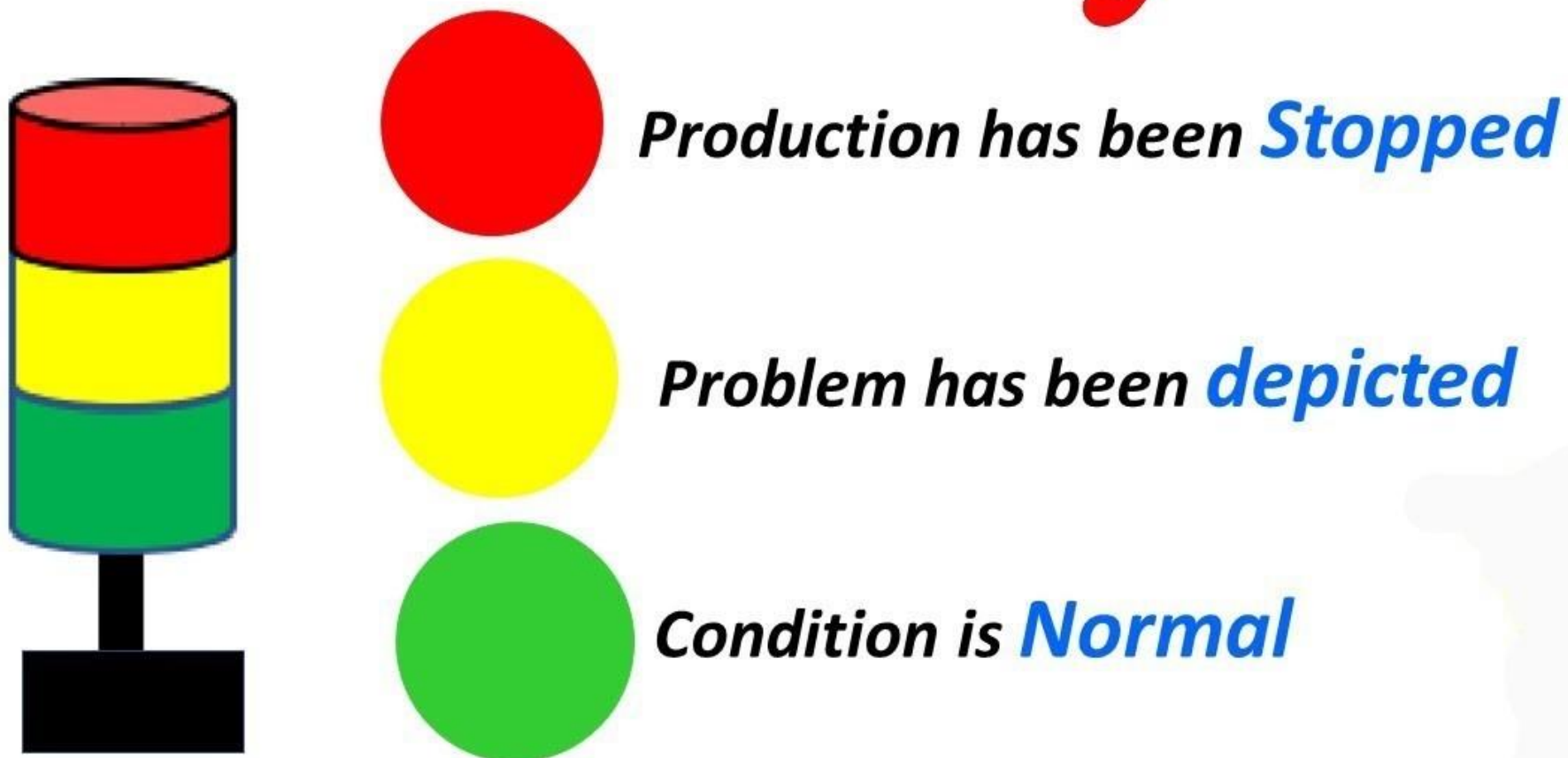
Organize and manage the work area:

- Sort (eliminate that which is not needed)
- Set In Order (organize remaining items)
- Shine (clean and inspect work area)
- Standardize (write standards for above)
- Sustain (regularly apply the standards)

## How does 5S help?

Eliminates waste that results from a poorly organized work area (e.g. wasting time looking for a tool).

# Andon System

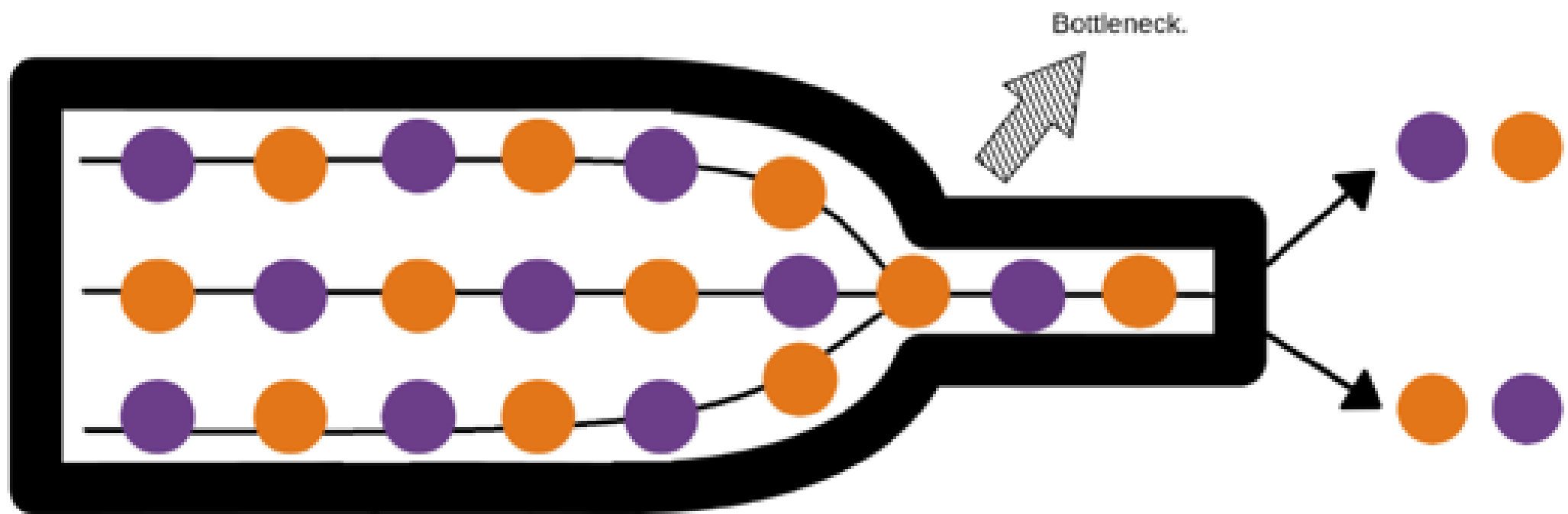


## **What is Andon?**

Visual feedback system for the plant floor that indicates production status, alerts when assistance is needed, and empowers operators to stop the production process.

## **How does Andon help?**

Acts as a real-time communication tool for the plant floor that brings immediate attention to problems as they occur – so they can be instantly addressed.



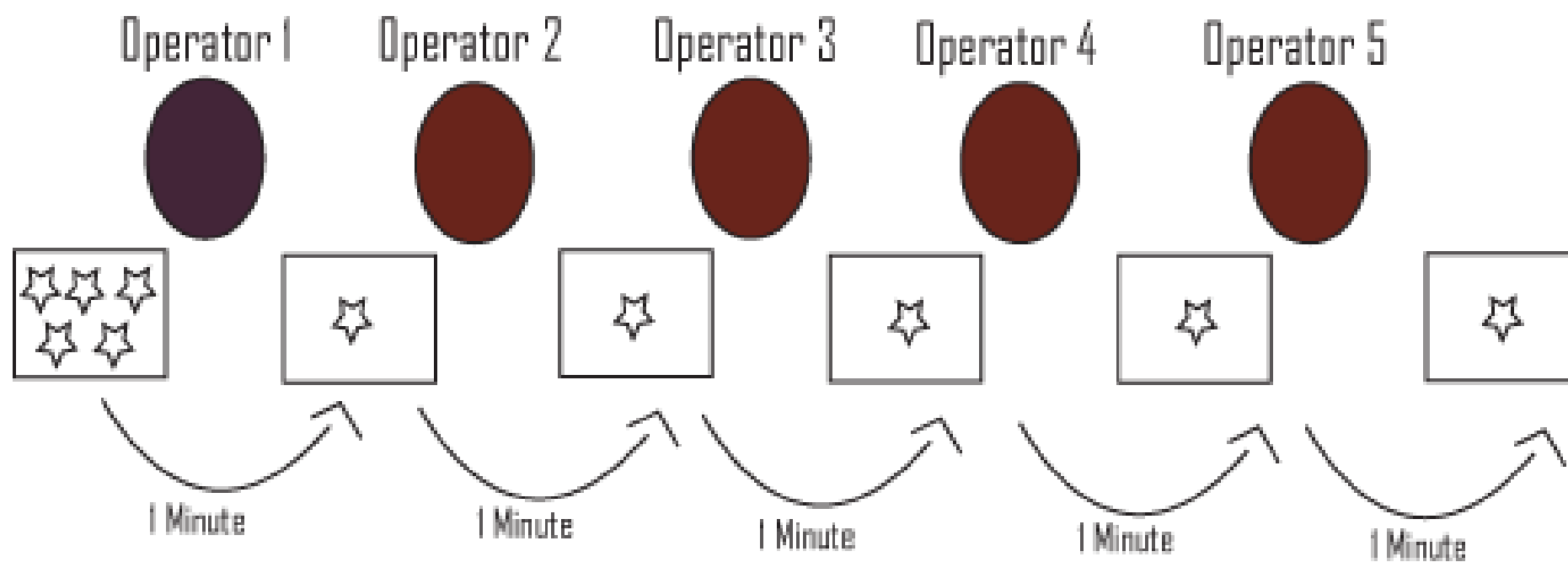
## **What is Bottleneck Analysis?**

Identify which part of the manufacturing process limits the overall throughput and improve the performance of that part of the process.

### **How does Bottleneck Analysis help?**

Improves throughput by strengthening the weakest link in the manufacturing process.

## Lean Flow - Example



**Total Time for process = 9 Minutes**

## What is Continuous Flow?

Manufacturing where work-in-process smoothly flows through production with minimal (or no) buffers between steps of the manufacturing process.

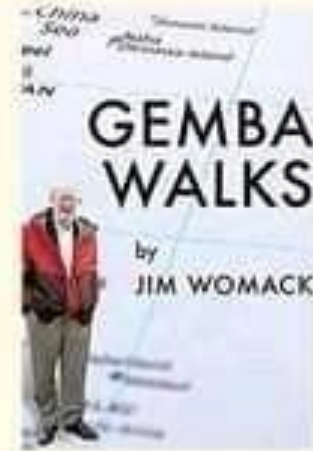
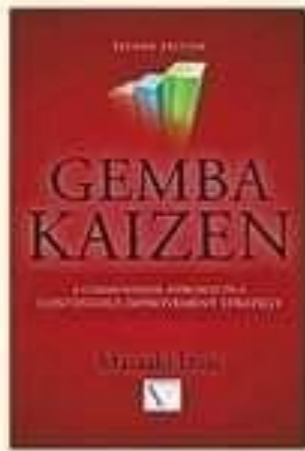
### How does Continuous Flow help?

Eliminates many forms of waste (e.g. inventory, waiting time, and transport).



Did you know?

GEMBA is not a Japanese Term!



Due to pronunciation matter, the original Japanese term "Genba" is sometimes written as "Gemba".

TQM for better future

Many people say "Gemba" is a Japanese term which means actual place.

But if we google it for translation, we can never get it as Japanese word. Logically meaning will also not come out!

Basically "Genba" is the original Japanese term.

In hiragana:げんば; in kanji 現場;  
If we split the word,  
現 (gen) : actual/current,  
場 (ba): location/place

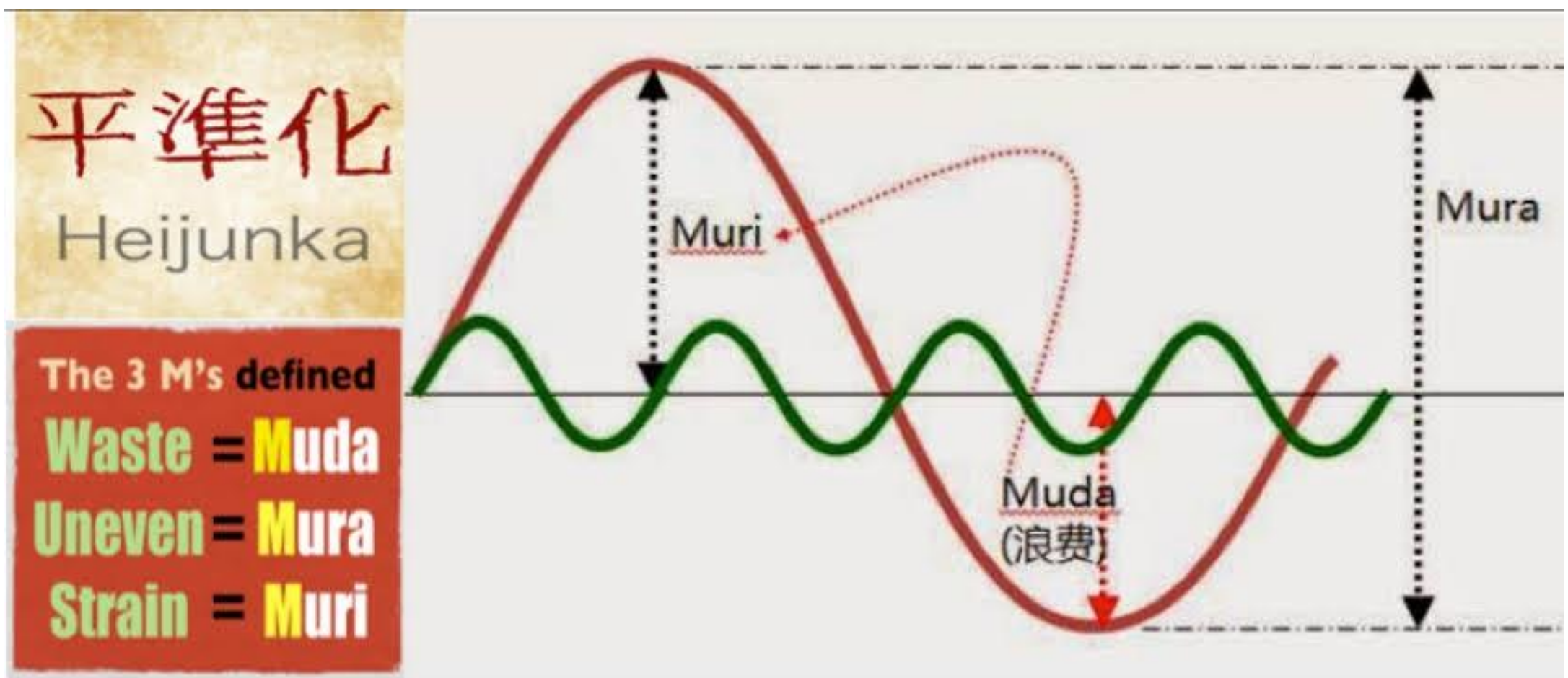
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## What is Gemba?

A philosophy that reminds us to get out of our offices and spend time on the plant floor – the place where real action occurs.

## How does Gemba help?

Promotes a deep and thorough understanding of real-world manufacturing issues – by first-hand observation and by talking with plant floor employees.



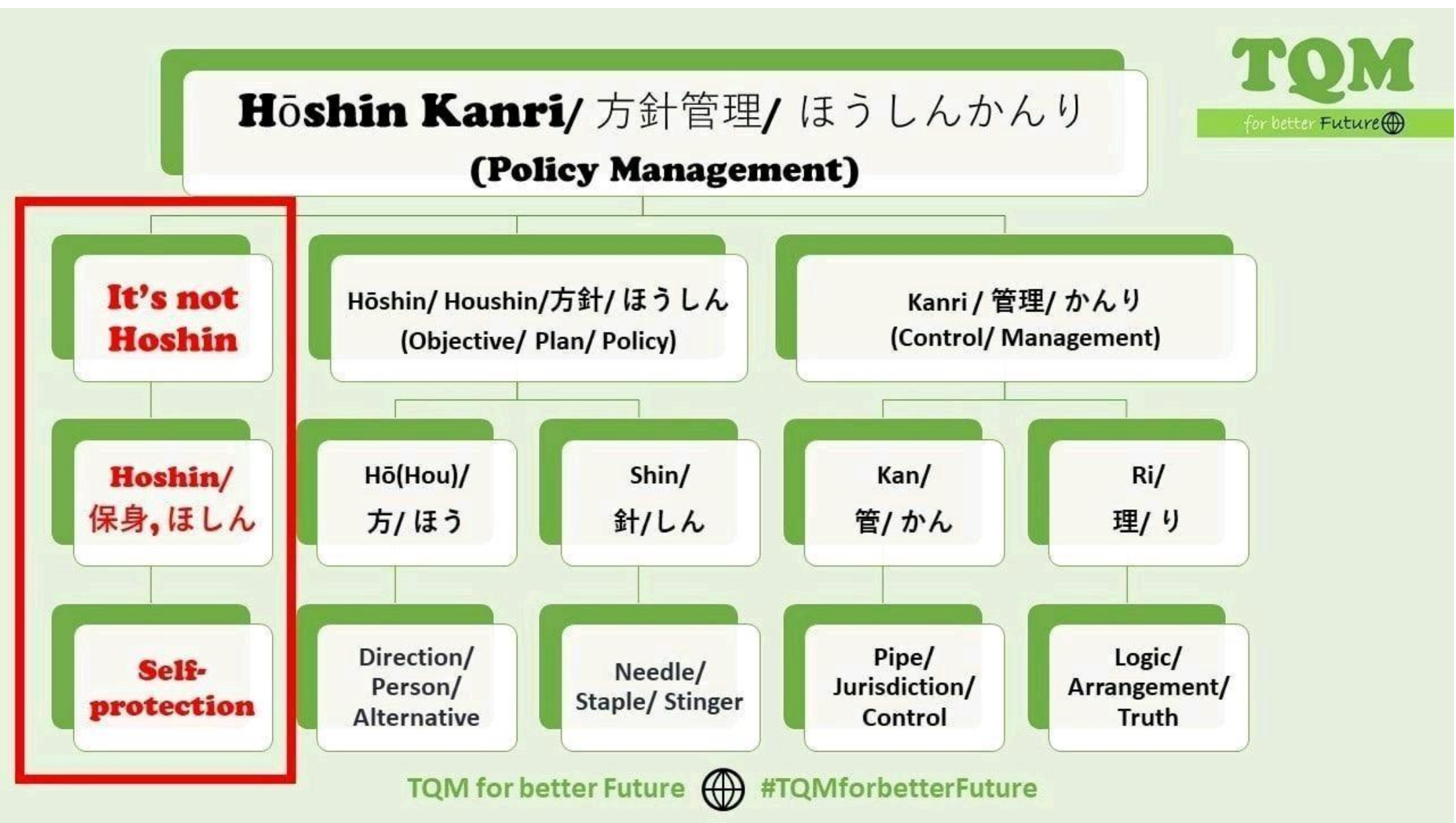
## What is Heijunka?

A form of production scheduling that purposely manufactures in much smaller batches by sequencing (mixing) product variants within the same process.

### How does Heijunka help?

Reduces lead times (since each product or variant is manufactured more frequently) and inventory (since batches are smaller).





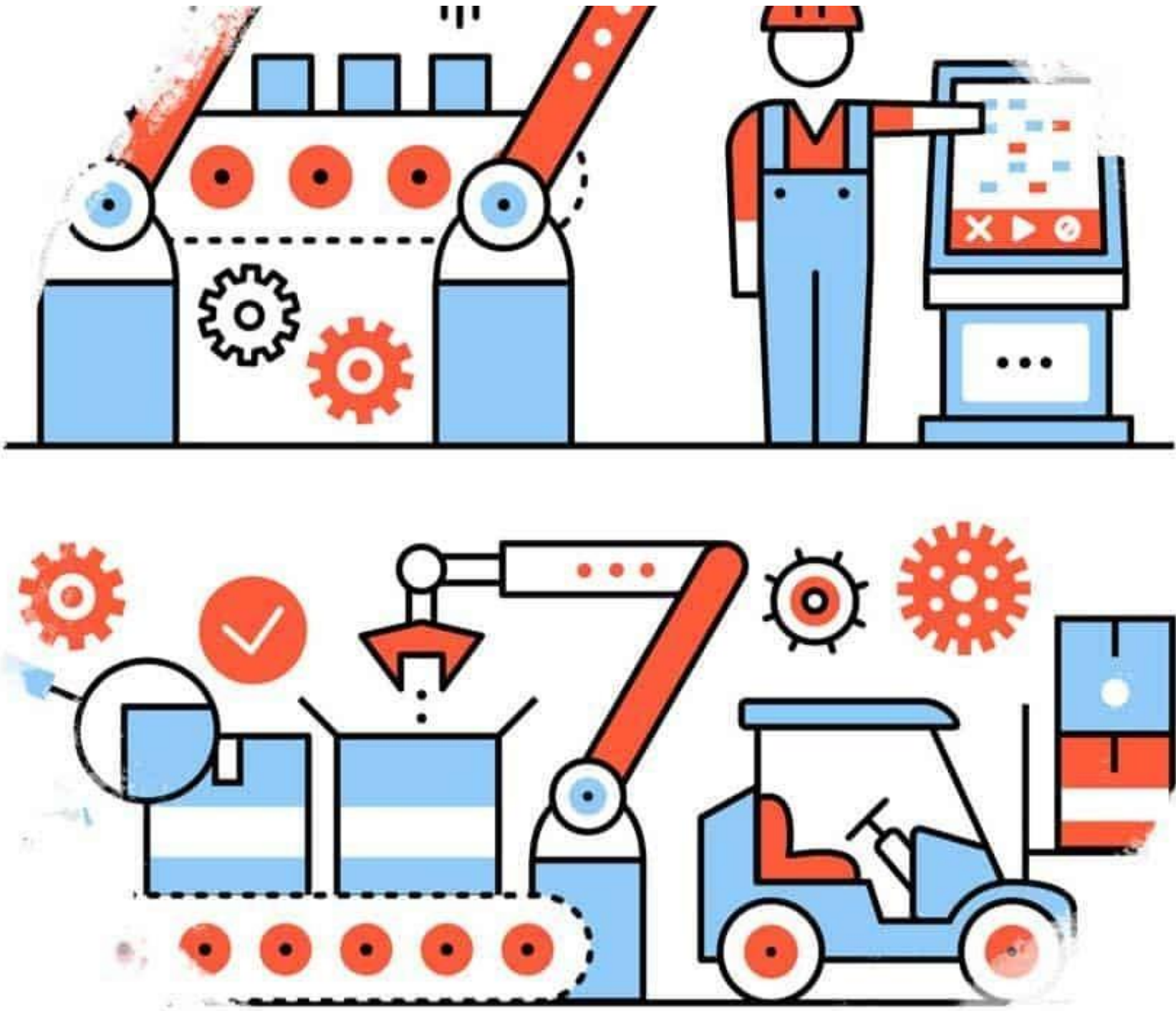
## What is Hoshin Kanri?

Align the goals of the company (Strategy), with the plans of middle management (Tactics) and the work performed on the plant floor (Action).

### How does Hoshin Kanri help?

Ensures that progress towards strategic goals is consistent and thorough – eliminating the waste that comes from poor communication and inconsistent direction.

# Automation



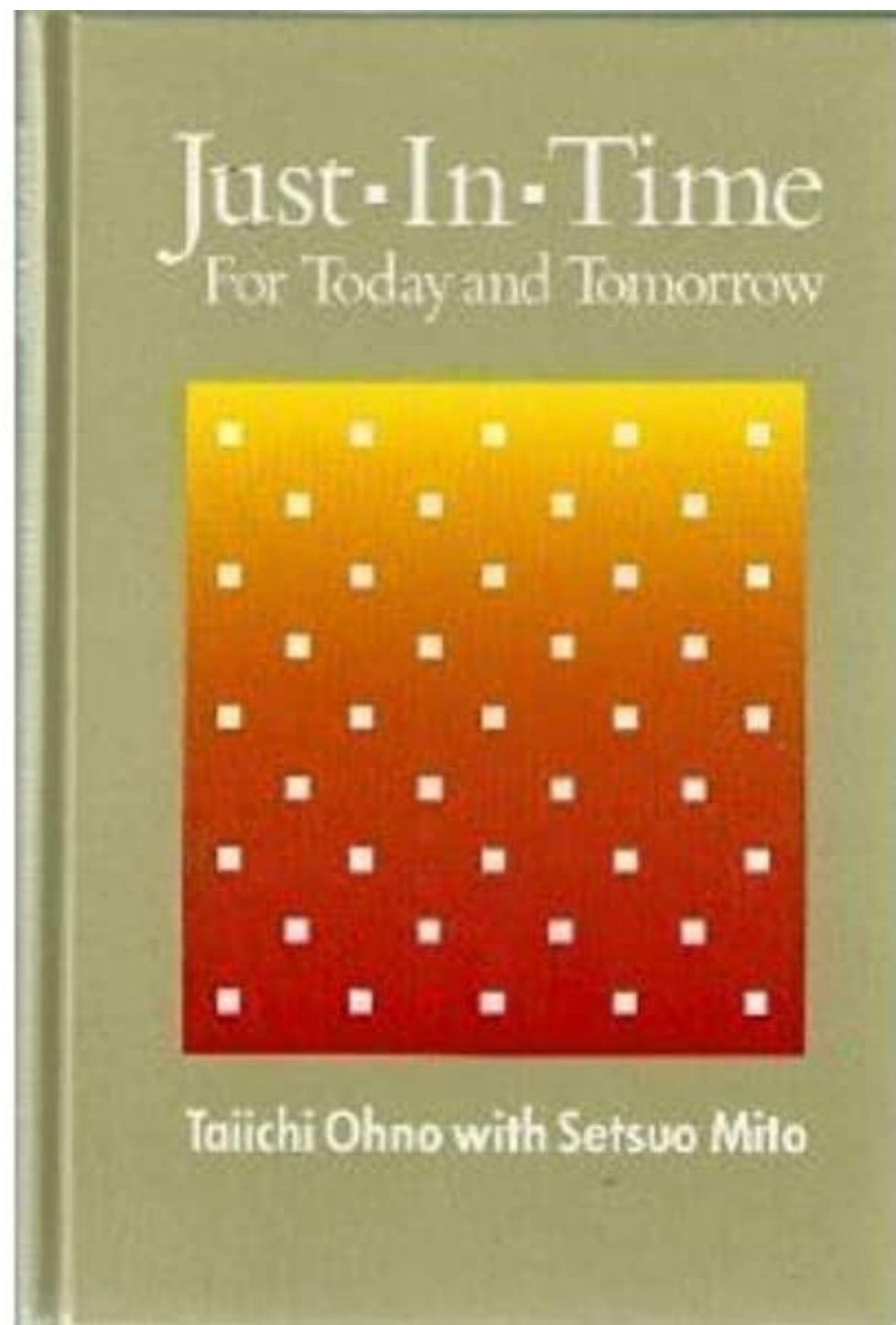
## What is Jidoka?

Design equipment to partially automate the manufacturing process (partial automation is typically much less expensive than full automation) and to automatically stop when defects are detected.

## How does Jidoka help?

After Jidoka, workers can frequently monitor multiple stations (reducing labor costs) and many quality issues can be detected immediately (improving quality).



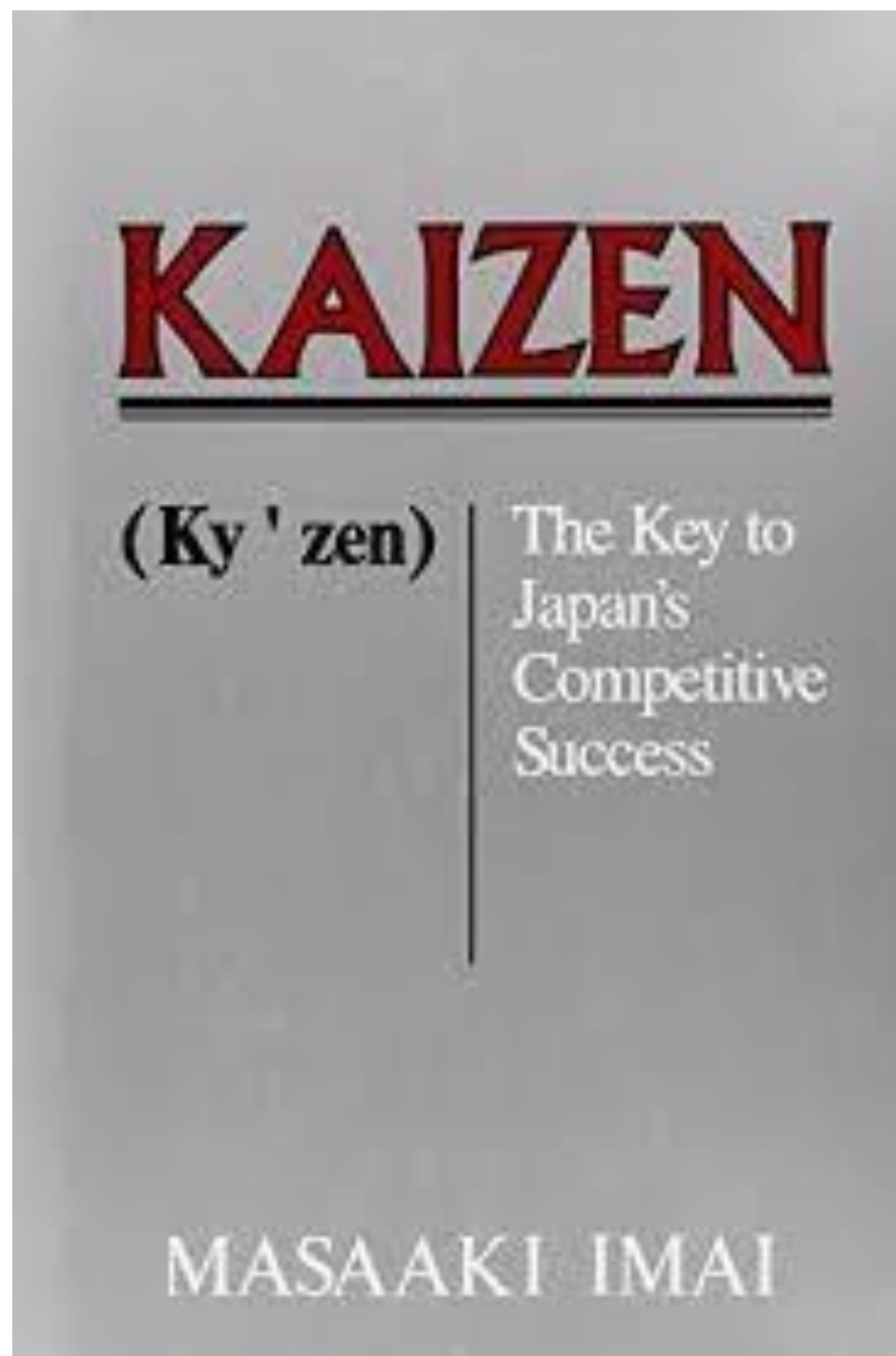


## **What is Just-In-Time?**

Pull parts through production based on customer demand instead of pushing parts through production based on projected demand. Relies on many lean tools, such as Continuous Flow, Heijunka, Kanban, Standardized Work and Takt Time.

## **How does Just-In-Time help?**

Highly effective in reducing inventory levels. Improves cash flow and reduces space requirements.

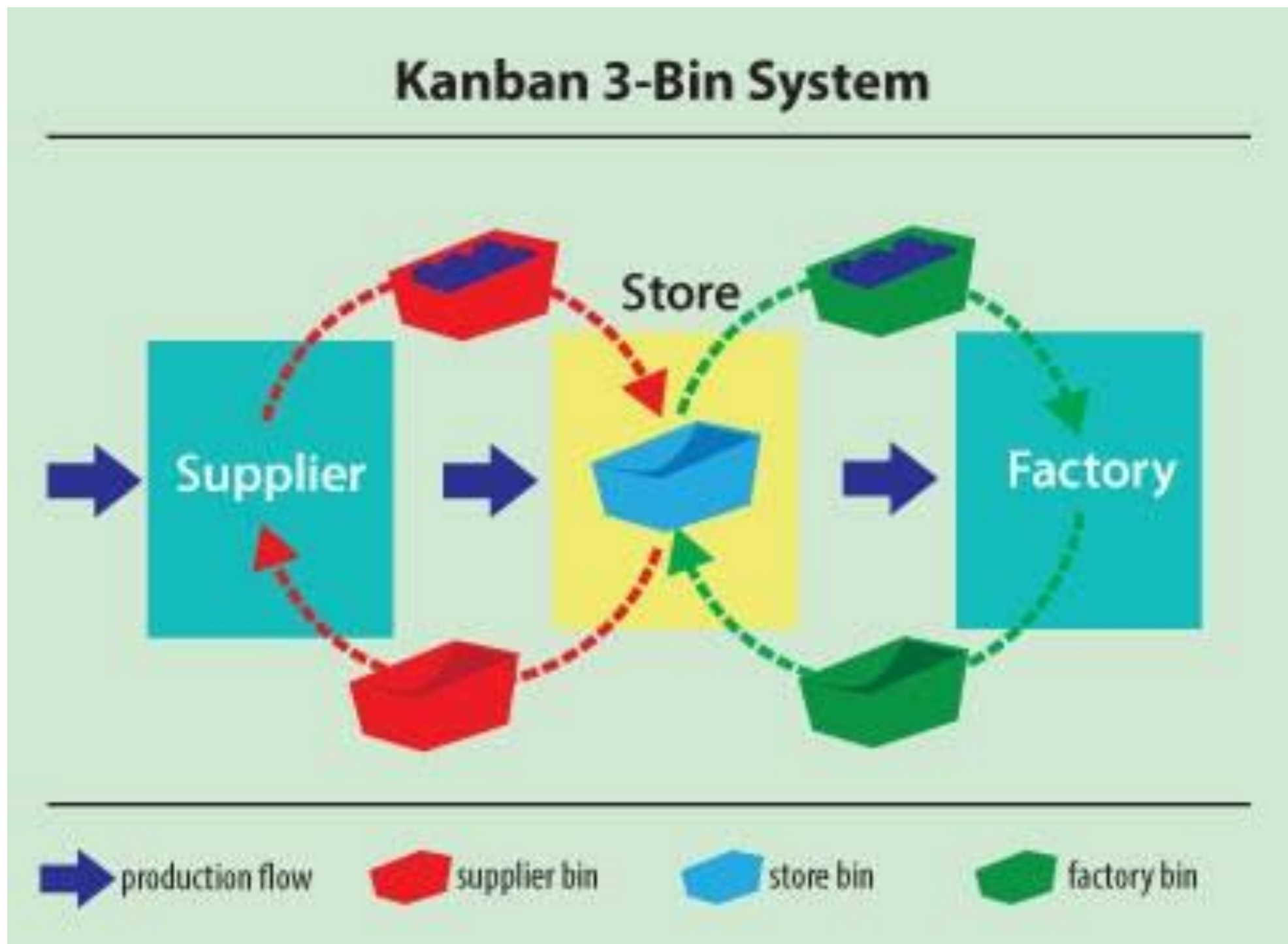


## **What is Kaizen?**

A strategy where employees work together proactively to achieve regular, incremental improvements in the manufacturing process.

## **How does Kaizen help?**

Combines the collective talents of a company to create an engine for continually eliminating waste from manufacturing processes.



## What is Kanban?

A method of regulating the flow of goods both within the factory and with outside suppliers and customers. Based on automatic replenishment through signal cards that indicate when more goods are needed.

## How does Kanban help?

Eliminates waste from inventory and overproduction. Can eliminate the need for physical inventories (instead relying on signal cards to indicate when more goods need to be ordered).





## What are KPIs?

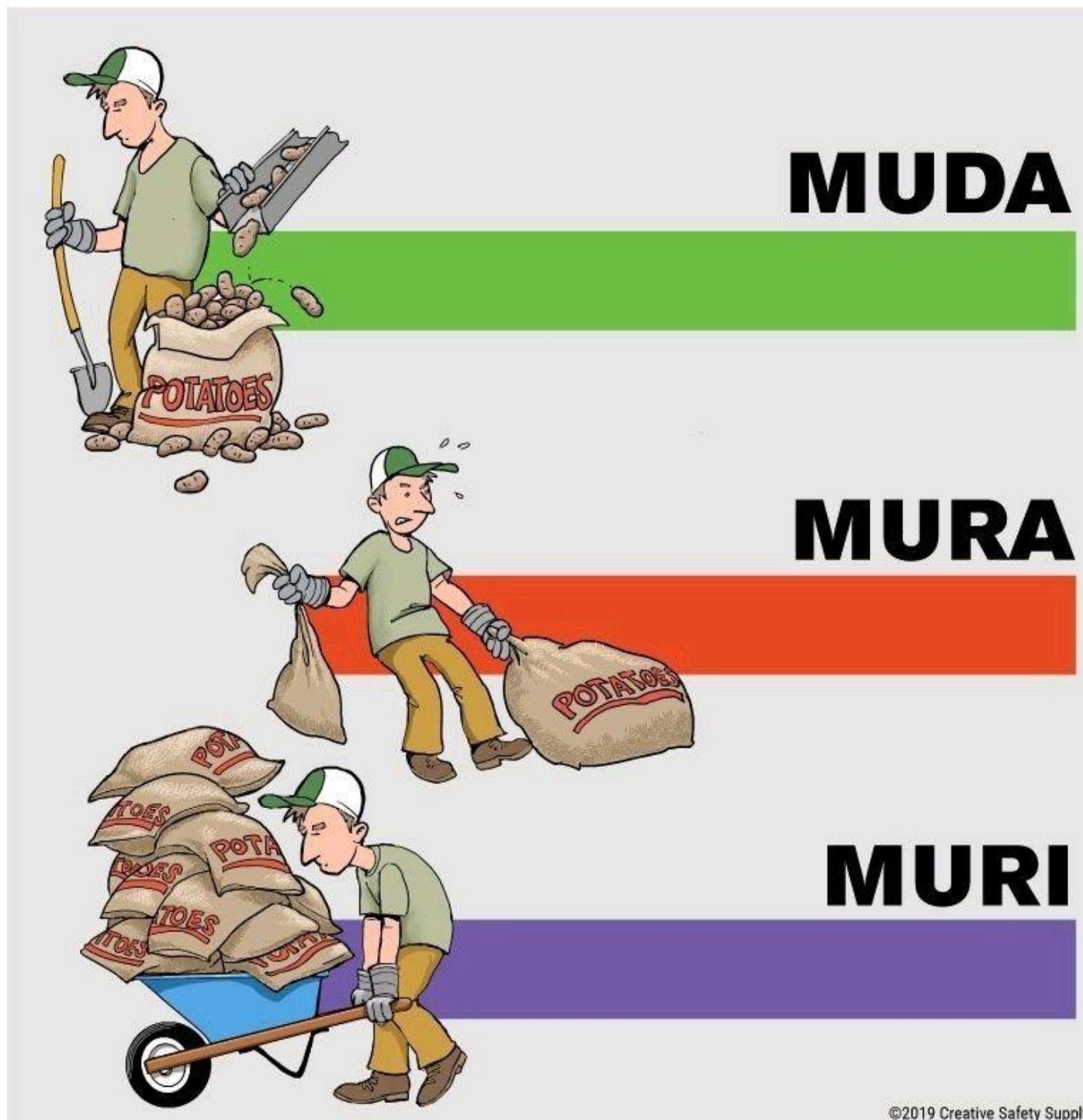
Metrics designed to track and encourage progress towards critical goals of the organization. Strongly promoted KPIs can be extremely powerful drivers of behavior – so it is important to carefully select KPIs that will drive desired behavior.

## How do KPIs help?

The best manufacturing KPIs:

- Are aligned with top-level strategic goals (thus helping to achieve those goals)
- Are effective at exposing and quantifying waste (OEE is a good example)
- Are readily influenced by plant floor employees (so they can drive results)



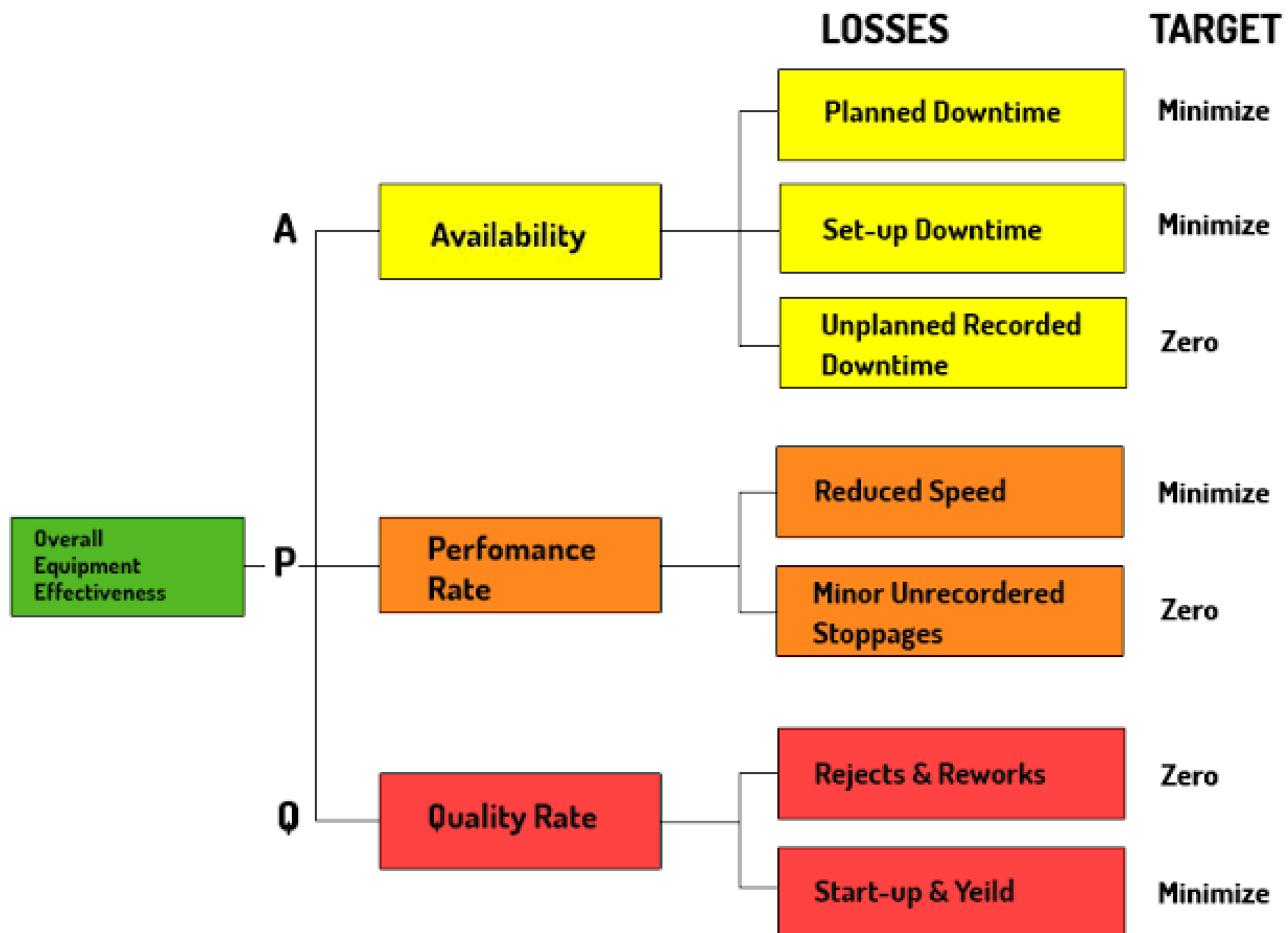


## What is Muda?

Anything in the manufacturing process that does not add value from the customer's perspective.

### How does Muda help?

It doesn't. Muda means 'waste'. The elimination of muda (waste) is the primary focus of lean manufacturing.



## What is Overall Equipment Effectiveness?

Framework for measuring productivity loss for a given manufacturing process. Three categories of loss are tracked:

- Availability (e.g. down time)
- Performance (e.g. slow cycles)
- Quality (e.g. rejects)

## How does Overall Equipment Effectiveness help?

Provides a benchmark/baseline and a means to track progress in eliminating waste from a manufacturing process. 100% OEE means perfect production (manufacturing only good parts, as fast as possible, with no down time).

## Correlation Between The Deming Wheel and The Japanese PDCA Cycle

<b>1. Design =&gt; Plan</b>	Product design corresponds to the planning phase of management.
<b>2. Production =&gt; Do</b>	Production corresponds to doing, making or working on the product that was designed.
<b>3. Sales =&gt; Check</b>	Sales figures confirm whether the customer is satisfied.
<b>4. Research =&gt; Act</b>	If a complaint is filed, it must be incorporated into the planning phase and action taken in the next round of efforts

Reference: Foundation and History of the PDSA Cycle By Ronald Moen



Fig- The Deming Wheel (1950)

### What is PDCA?

An iterative methodology for implementing improvements:

- Plan (establish plan and expected results)
- Do (implement plan)
- Check (verify expected results achieved)
- Act (review and assess; do it again)

### How does PDCA help?

Applies a scientific approach to making improvements:

- Plan (develop a hypothesis)
- Do (run experiment)
- Check (evaluate results)
- Act (refine your experiment; try again)



# POKA-YOKE

## Error Proofing

Poka-Yoke, the Term adopted by Dr. Shigeo Shingo as a part of the Toyota Production System in 1960.

- The initial term was 'baka-yoke', which means 'fool-proofing'.
- A poka-yoke is any mechanism in a process that helps any person to **avoid errors/ mistakes/ defects by preventing, correcting, or drawing attention** to human errors as they occur.

### COMMON EXAMPLES

- Automated shut-offs on electric coffee pots.
- Spell check in MS Office word processing.



## What is Poka-Yoke?

Design error detection and prevention into production processes with the goal of achieving zero defects.

### How does Poka-Yoke help?

It is difficult (and expensive) to find all defects through inspection, and correcting defects typically gets significantly more expensive at each stage of production.



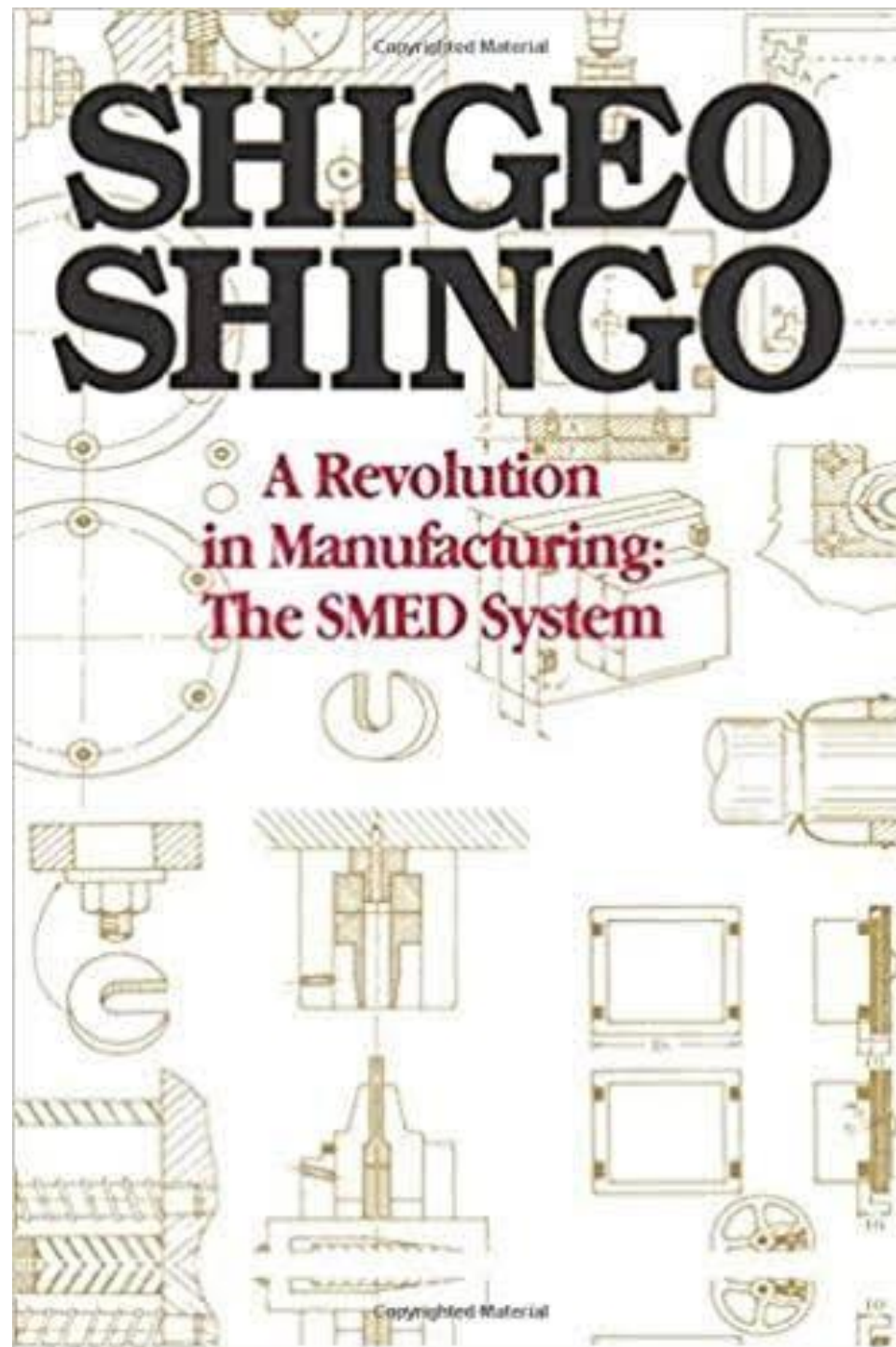


## **What is Root Cause Analysis?**

A problem solving methodology that focuses on resolving the underlying problem instead of applying quick fixes that only treat immediate symptoms of the problem. A common approach is to ask why five times – each time moving a step closer to discovering the true underlying problem.

### **How does Root Cause Analysis help?**

Helps to ensure that a problem is truly eliminated by applying corrective action to the “root cause” of the problem.



## **What is Single-Minute Exchange of Dies?**

Reduce setup (changeover) time to less than 10 minutes.  
Techniques include:

- Convert setup steps to be external (performed while the process is running)
- Simplify internal setup (e.g. replace bolts with knobs and levers)
- Eliminate non-essential operations
- Create Standardized Work instructions

## **How does Single-Minute Exchange of Dies help?**

Enables manufacturing in smaller lots, reduces inventory, and improves customer responsiveness.

Overall Equipment Effectiveness	Recommended Six Big Losses	Traditional Six Big Losses
Availability Loss	Unplanned Stops	Equipment Failure
	Planned Stops	Setup and Adjustments
Performance Loss	Small Stops	Idling and Minor Stops
	Slow Cycles	Reduced Speed
Quality Loss	Production Rejects	Process Defects
	Startup Rejects	Reduced Yield
OEE	Fully Productive Time	Valuable Operating Time

## What is Six Big Losses?

Six categories of productivity loss that are almost universally experienced in manufacturing:

- Breakdowns
- Setup/Adjustments
- Small Stops
- Reduced Speed
- Startup Rejects
- Production Rejects

## How does Six Big Losses help?

Provides a framework for attacking the most common causes of waste in manufacturing.



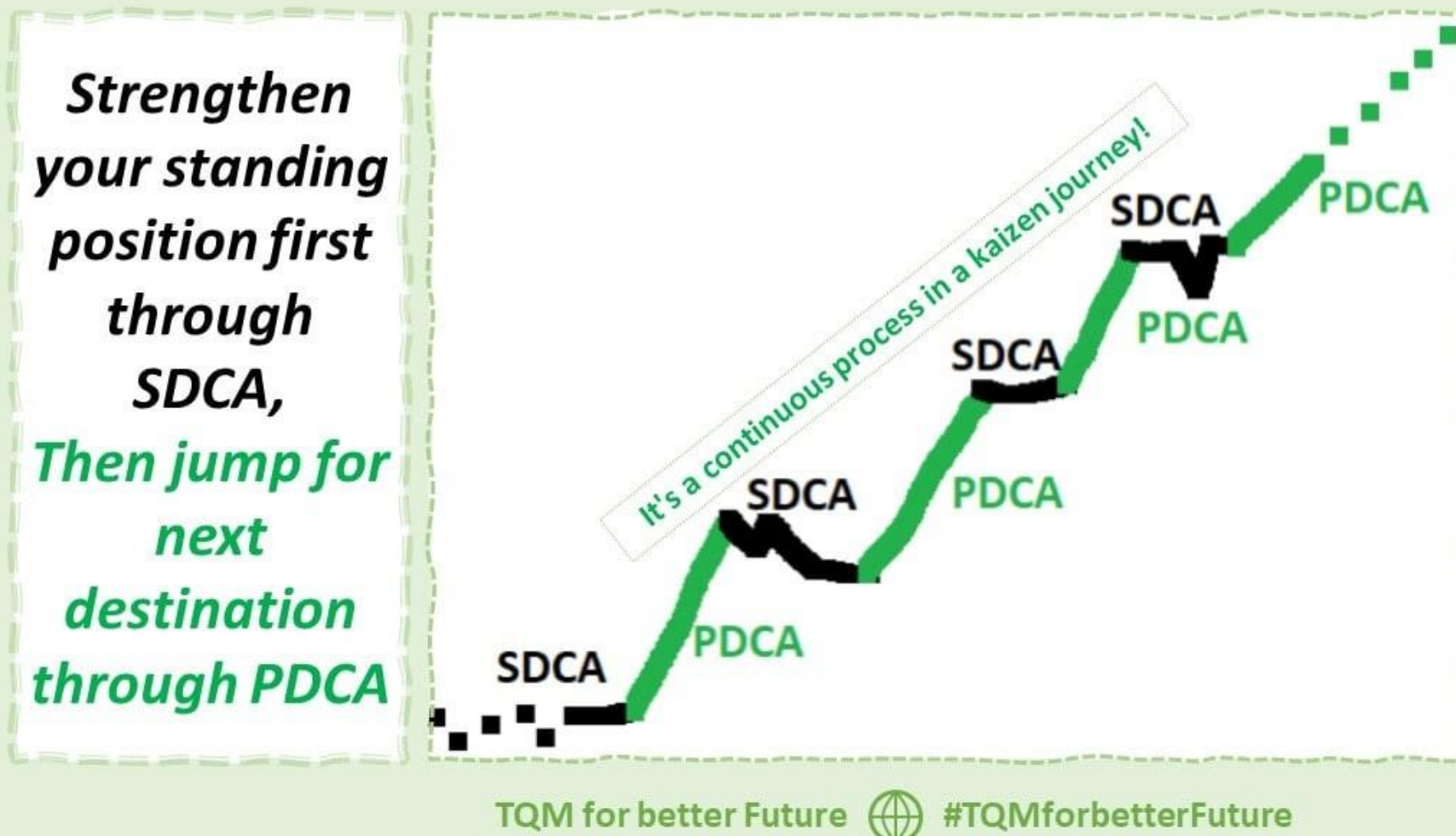
SMART GOALS	
<b>S</b>	<b>SPECIFIC</b> State exactly what you want to accomplish.
<b>M</b>	<b>MEASURABLE</b> Use smaller, mini-goals to measure progress.
<b>A</b>	<b>ACHIEVABLE</b> Make your goal reasonable.
<b>R</b>	<b>REALISTIC</b> Set a goal that is relevant to your life.
<b>T</b>	<b>TIMELY</b> Give yourself time, but set a deadline.

## What are SMART Goals?

Goals that are: Specific, Measurable, Attainable, Relevant, and Time-Specific.

## How do SMART Goals help?

Helps to ensure that goals are effective.



## What is Standardized Work?

Documented procedures for manufacturing that capture best practices (including the time to complete each task). Must be “living” documentation that is easy to change.

### How does Standardized Work help?

Eliminates waste by consistently applying best practices. Forms a baseline for future improvement activities.



## Takt Time

$$\text{Takt Time} = \frac{\text{Working time available}}{\text{Customer demand}}$$

Full shift,  
minus breaks,  
meetings, etc.

$$\frac{450 \text{ minutes}}{50 \text{ units}} = 9 \text{ minutes}$$

Demand for  
that production  
period

Takt time is the required pace of  
production to meet demand.

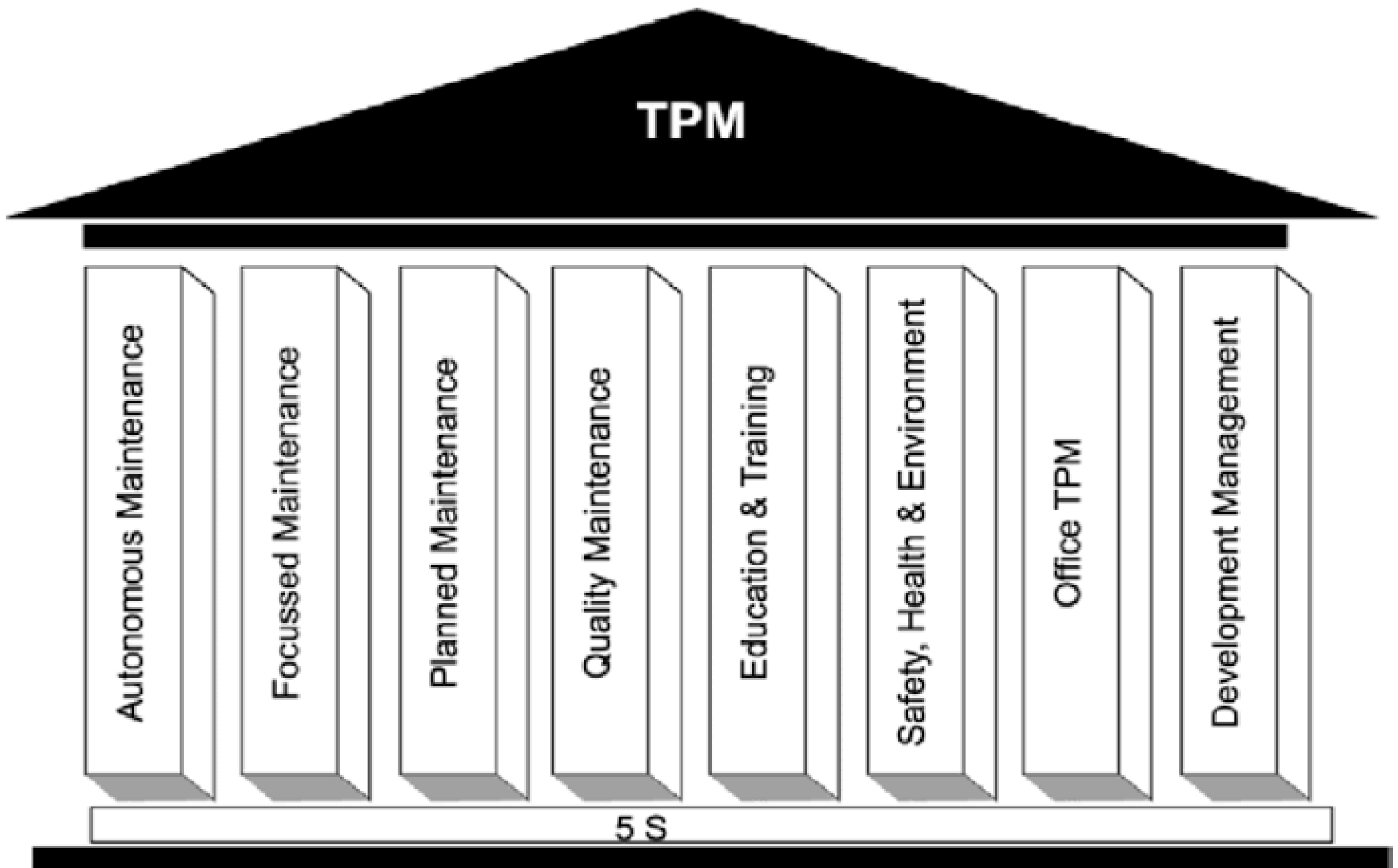
### What is Takt Time?

The pace of production (e.g. manufacturing one piece every 34 seconds) that aligns production with customer demand. Calculated as Planned Production Time / Customer Demand.

### How does Takt Time help?

Provides a simple, consistent and intuitive method of pacing production. Is easily extended to provide an efficiency goal for the plant floor (Actual Pieces / Target Pieces).



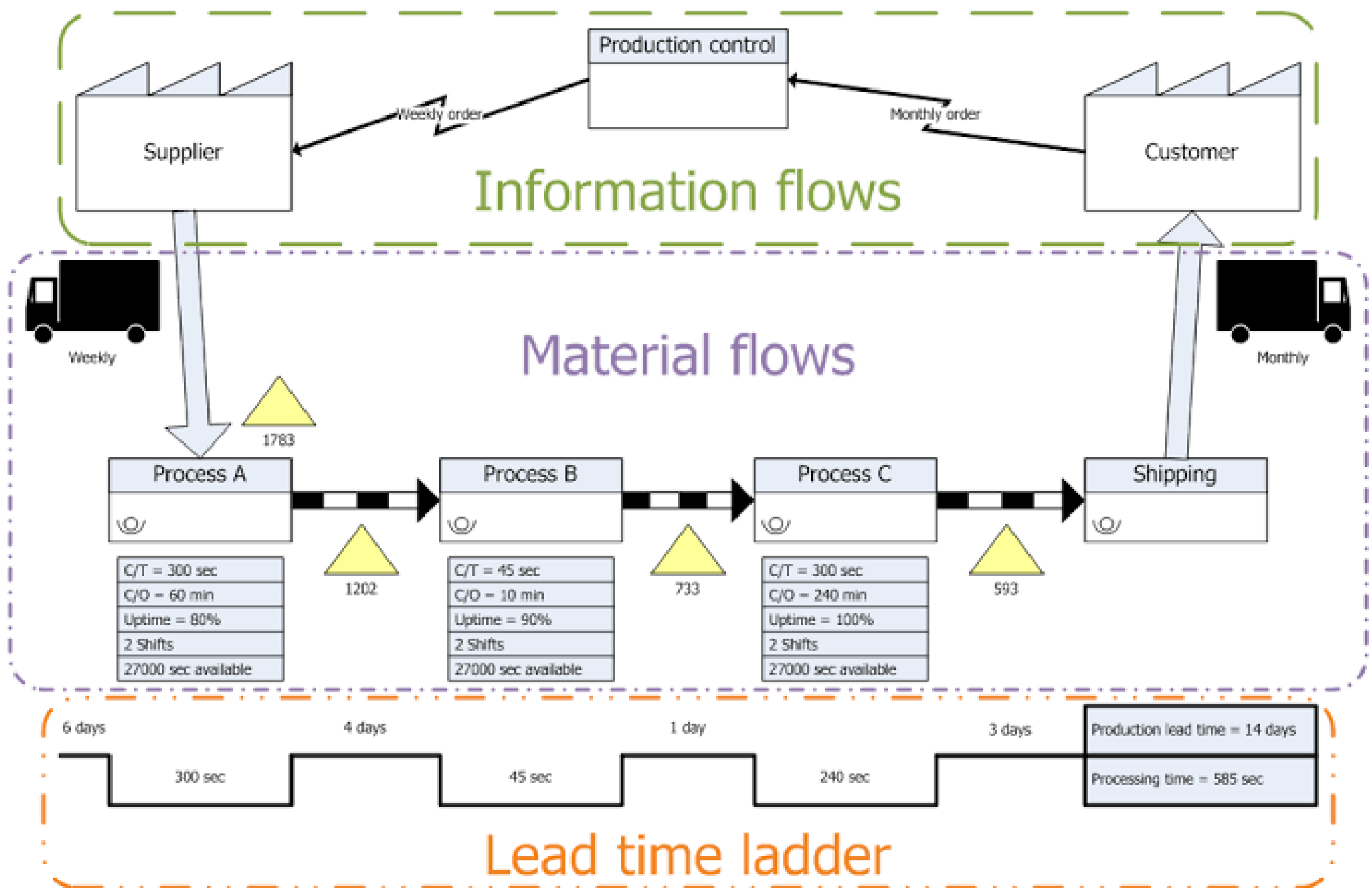


## What is Total Productive Maintenance?

A holistic approach to maintenance that focuses on proactive and preventative maintenance to maximize the operational time of equipment. TPM blurs the distinction between maintenance and production by placing a strong emphasis on empowering operators to help maintain their equipment.

### How does Total Productive Maintenance help?

Creates a shared responsibility for equipment that encourages greater involvement by plant floor workers. In the right environment this can be very effective in improving productivity (increasing up time, reducing cycle times, and eliminating defects).

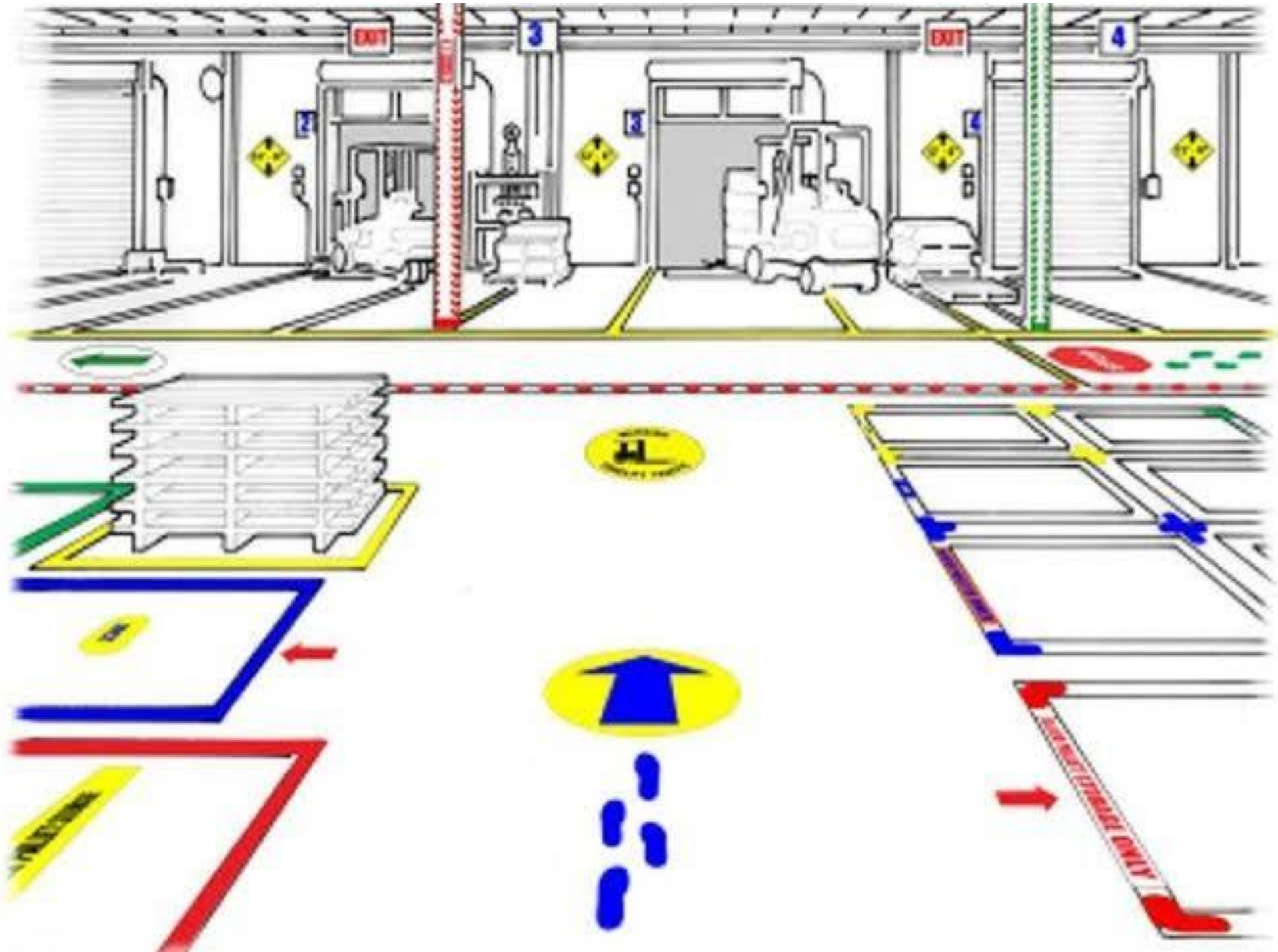


## What is Value Stream Mapping?

A tool used to visually map the flow of production. Shows the current and future state of processes in a way that highlights opportunities for improvement.

### How does Value Stream Mapping help?

Exposes waste in the current processes and provides a roadmap for improvement through the future state.



## What is Visual Factory?

Visual indicators, displays and controls used throughout manufacturing plants to improve communication of information.

### How does Visual Factory help?

Makes the state and condition of manufacturing processes easily accessible.



These terms recommended, endorsed or referred by **Toyota** as their own?

#TQMforbetterFuture

### The Term "Lean"

born in 1988 through MIT's SLOAN but arguably it's said that the term "Lean" born in 1990 through the book "THE MACHINE THAT CHANGED THE WORLD".

### "14 Management Principles"

described in "The Toyota Way" written by Dr. Jeffrey Liker published in 2003

1988

1997

2003

### "The 5 Lean Principles"

first described in 1997 by James P. Womack and Daniel T. Jones

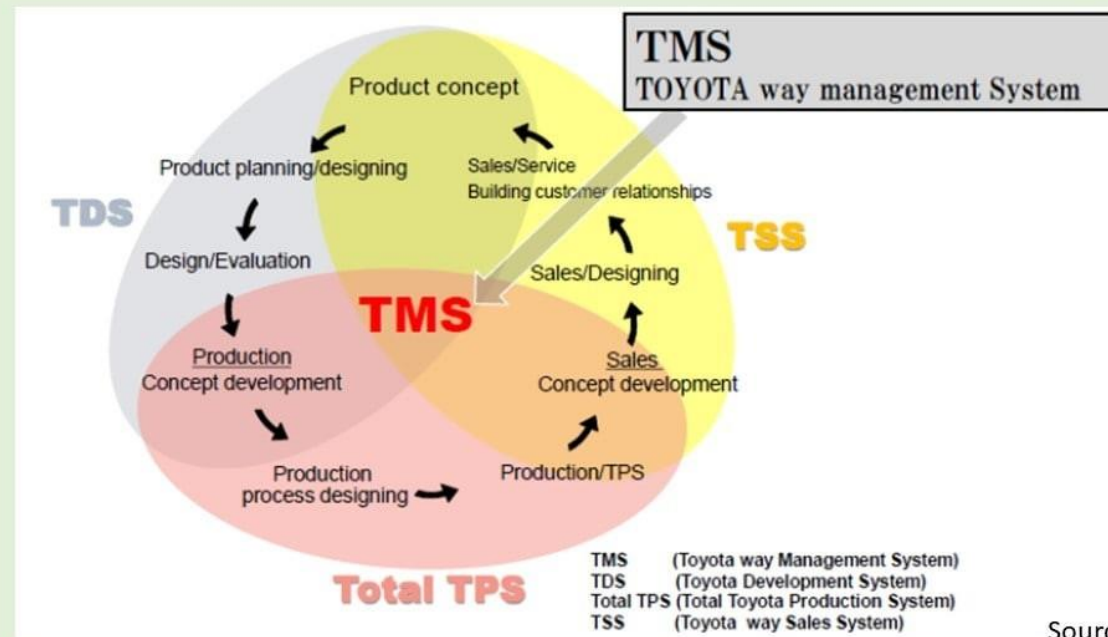
**The term "Lean" had not been originated from Toyota/ Japan/ Japanese Organization or Author !**

# Toyota way Management System (TMS)

TDS, Total TPS, TSS



for better Future



TQM for better Future #TQMforbetterFuture

## TOYOTA'S TQM Structure



for better Future

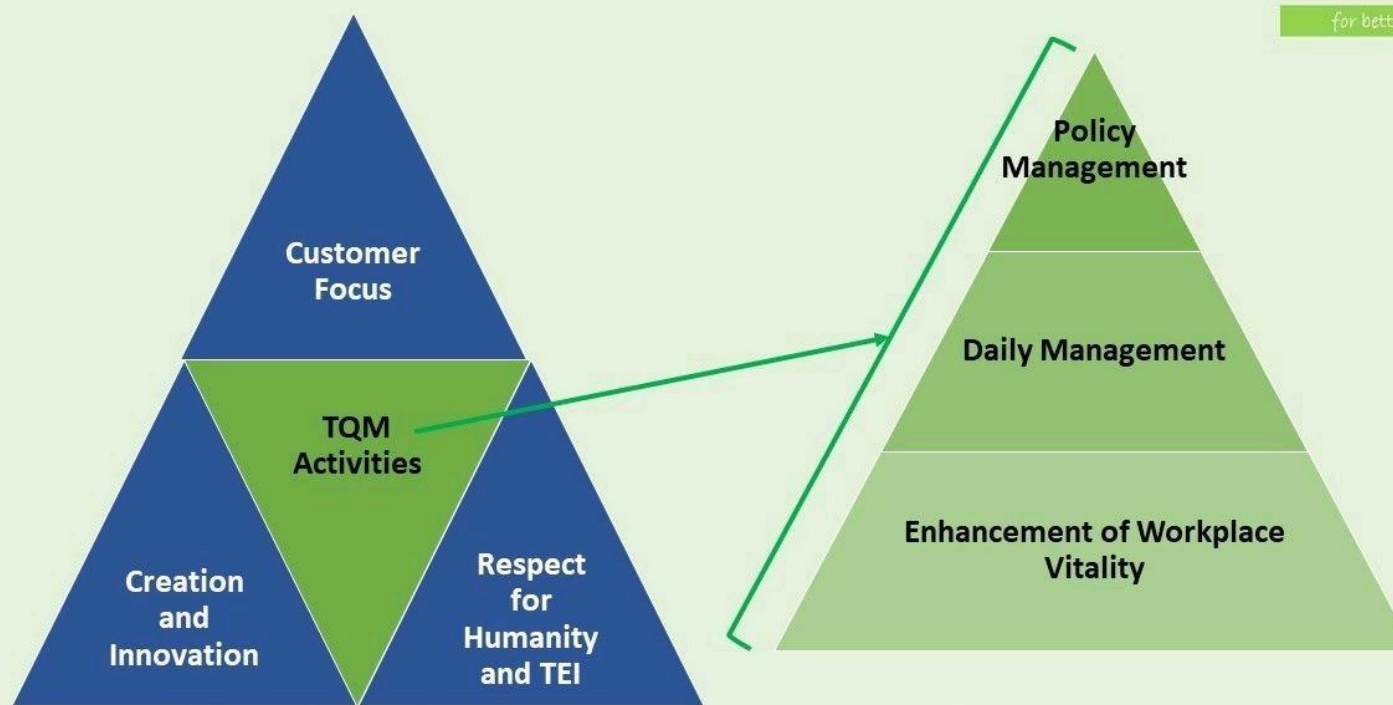


Fig-A: Toyota's TQM Concept

Fig-B: Toyota's TQM Activities

# Toyota's TQM History and Structure

## TOYOTA's TQM Structure

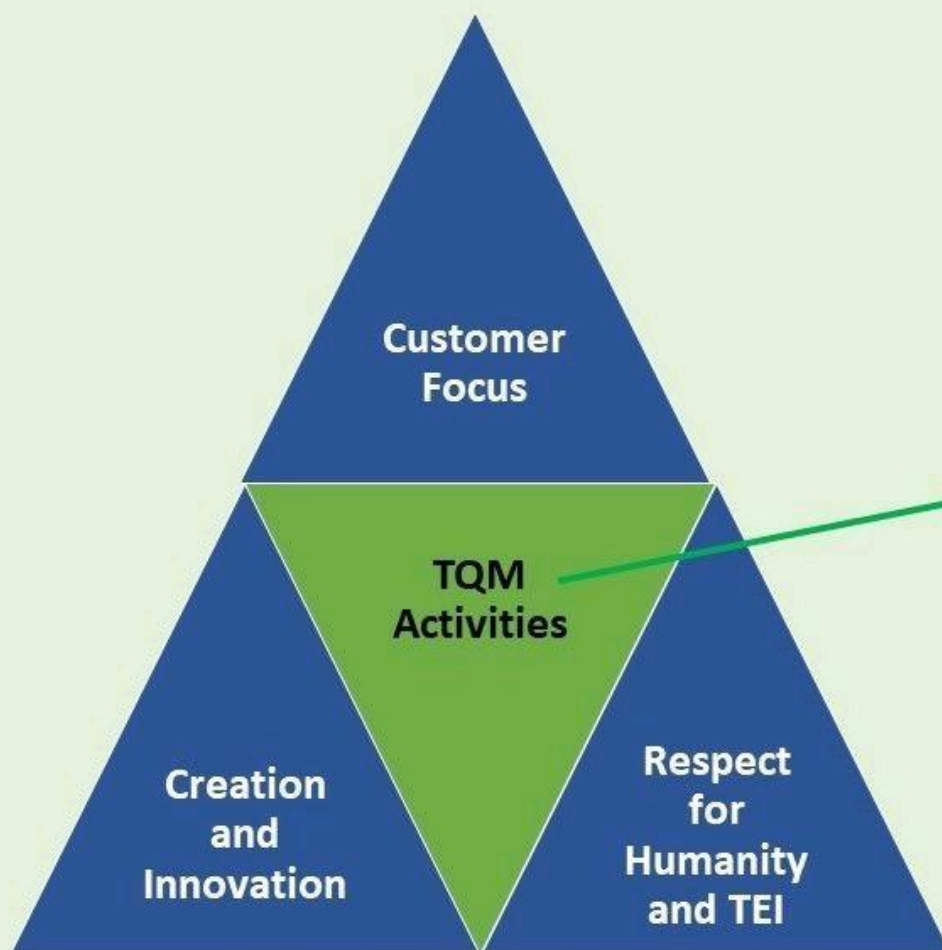


Fig-A: Toyota's TQM Concept

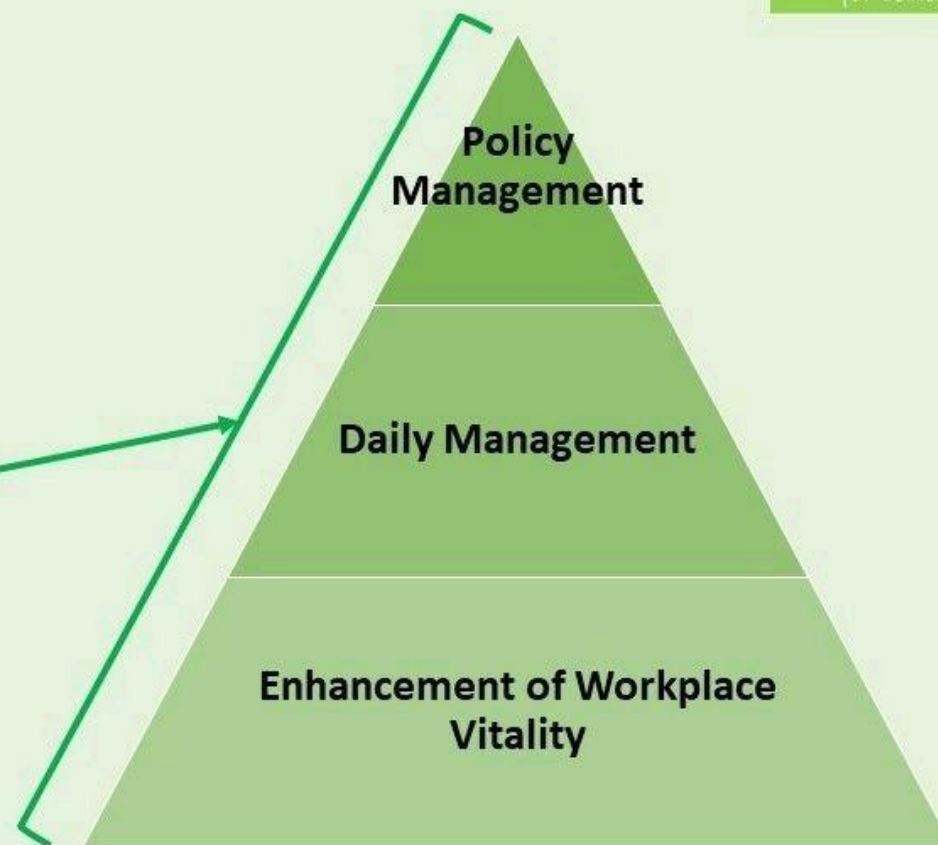


Fig-B: Toyota's TQM Activities

Based on the corporate philosophy of 'customer first' and 'quality first' since its founding, Toyota Motor Co., Ltd. won the Deming Application Prize in 1965 and the Japan Quality Control Award in 1970, following the introduction of statistical quality control (SQC) in 1949, and has conducted Total Quality Management (TQM) based on the unchanging principles of 'customer first', kaizen (continuous improvement), and 'total participation'.

[https://www.toyota-global.com/company/history\\_of\\_toyota/75years/data/company\\_information/management\\_and\\_finances/management/tqm/change.html](https://www.toyota-global.com/company/history_of_toyota/75years/data/company_information/management_and_finances/management/tqm/change.html)





**Thank You So Much For Your  
Kind Attention and Time !**

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