

LEAN MANUFACTURING

32 essential Lean Tools

SWIPE





5S

5S is a simple but effective way to eliminate waste and improve efficiency in the workplace.

Create a safe, organized, and productive work area through these 5 steps:

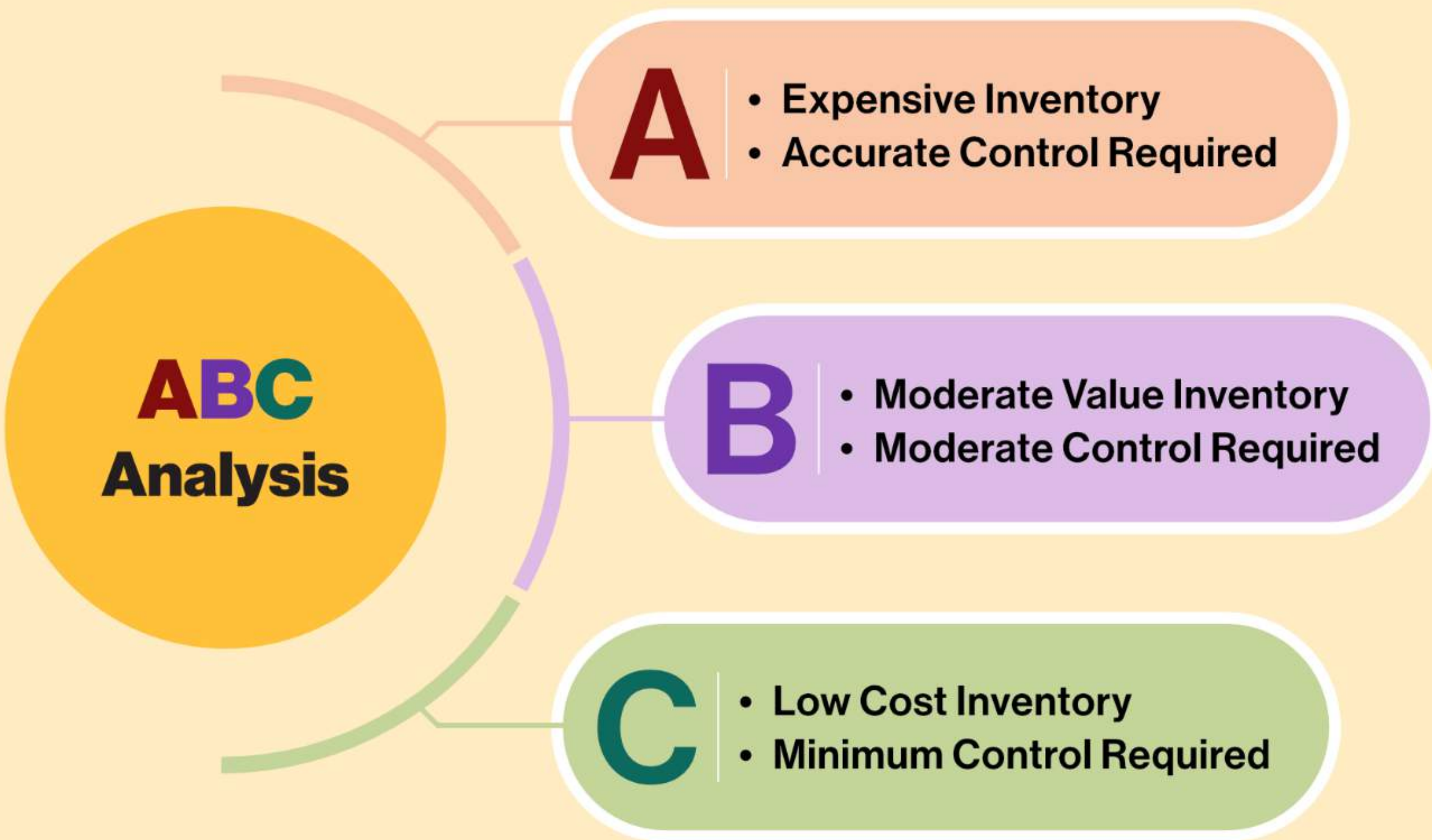


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ABC inventory

It is a method of classifying inventory items based on their importance. Items are divided into three categories: A, B, and C.

ABC Analysis



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graph LR; ABC((ABC Analysis)) --- A(A); ABC --- B(B); ABC --- C(C);
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A

- Expensive Inventory
- Accurate Control Required

B

- Moderate Value Inventory
- Moderate Control Required

C

- Low Cost Inventory
- Minimum Control Required



Andon

Andon refers to a visual system that is used to signal problems or defects in a production process.

Andon systems can help to improve production efficiency and quality



- Problem or Issue
- Stop or Restart
- Running Smoothly

Andon Light

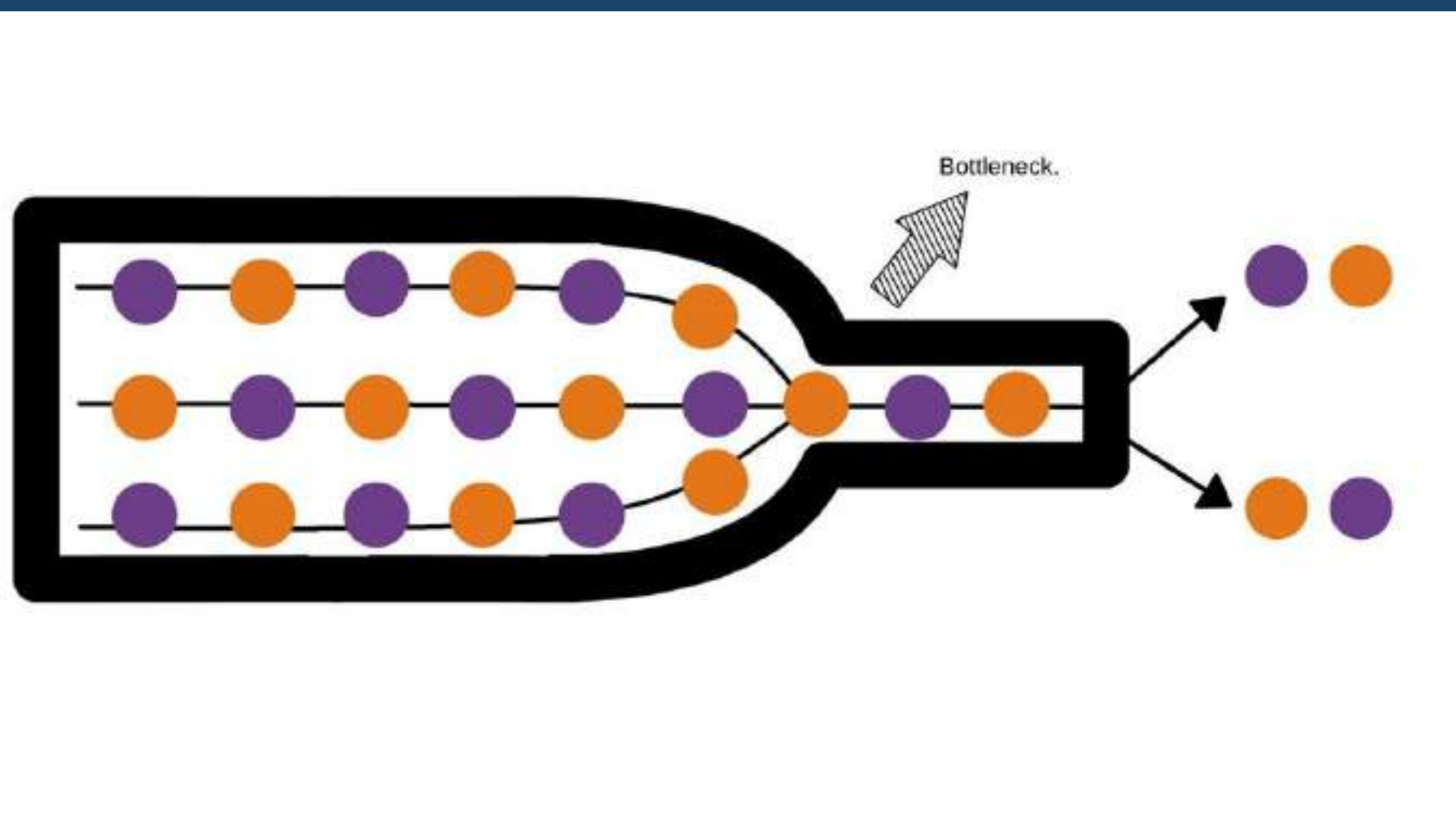


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Bottleneck analysis

It is a method of identifying the steps in a process that are limiting the overall output of the process.

Bottlenecks can occur anywhere in a process, from the initial planning stages to the final product or service delivery.



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Cellular Manufacturing

It is a manufacturing strategy that groups similar machines and processes together into cells.

This allows for the efficient production of similar products or families of products.

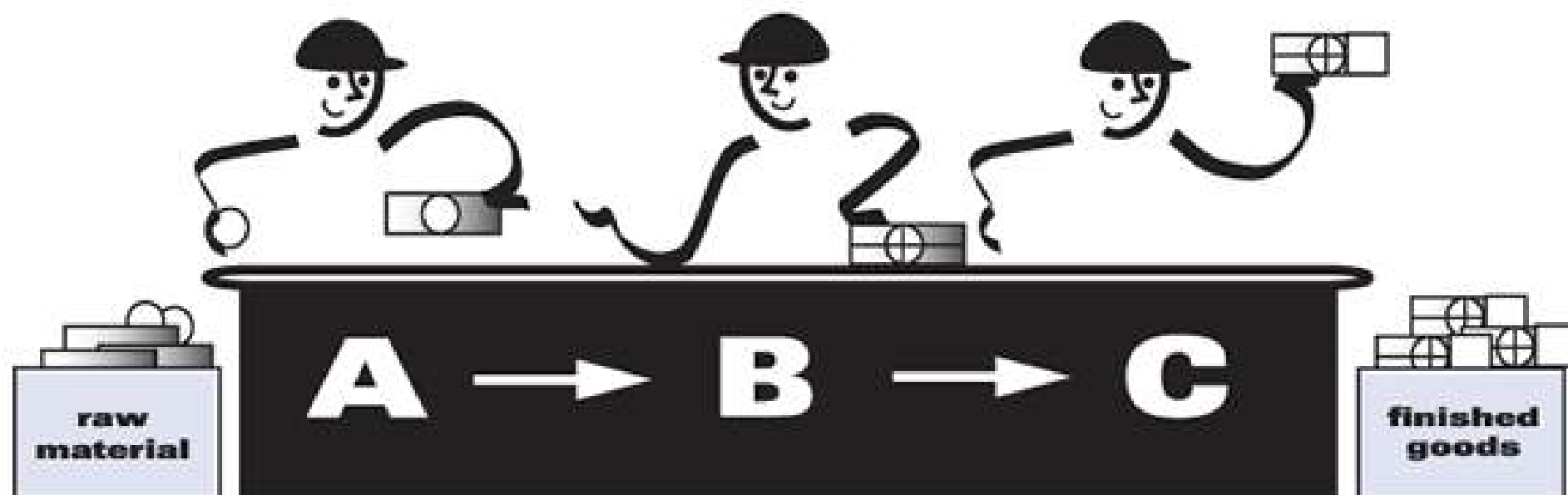




Continuous Flow

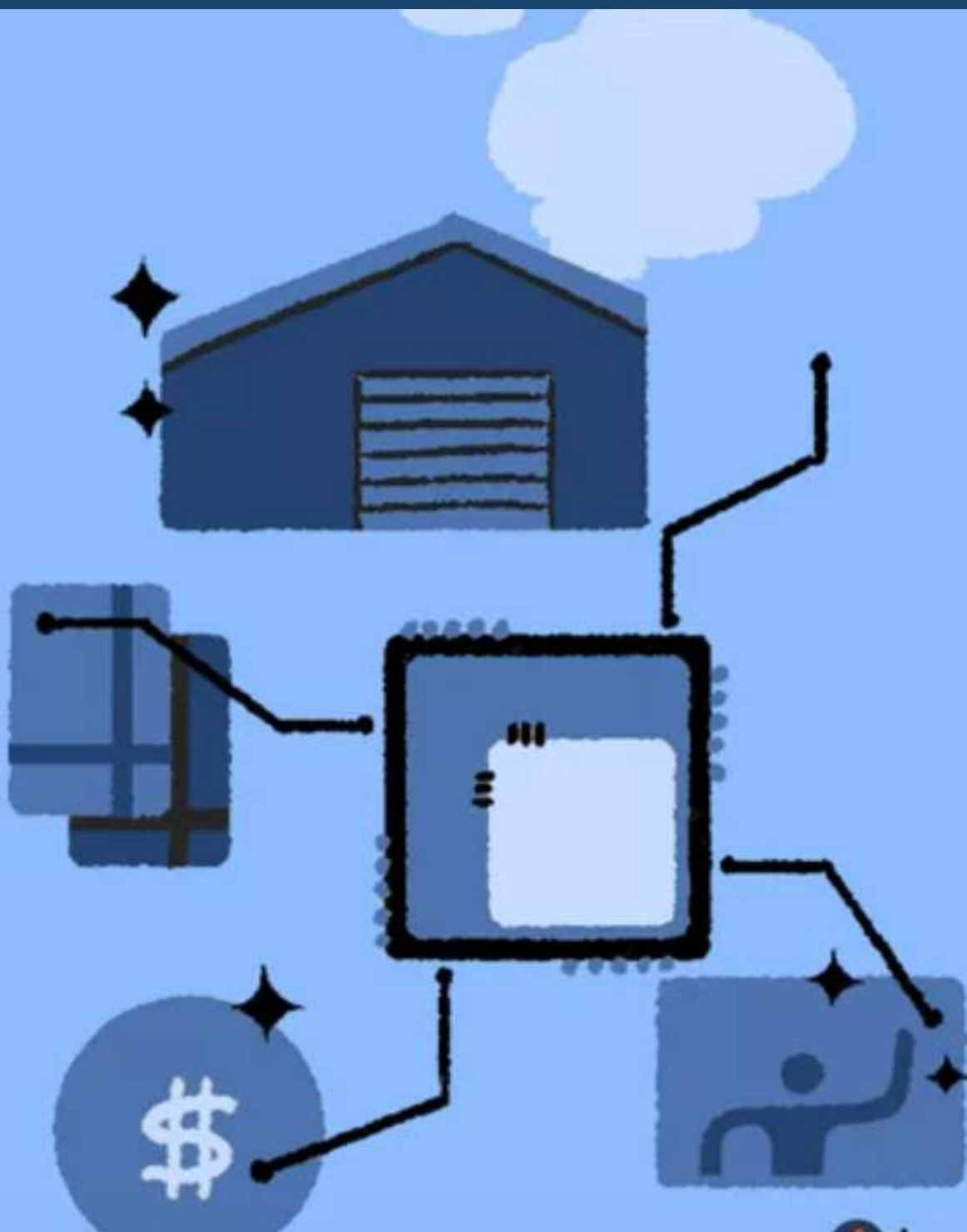
Continuous flow manufacturing (CFM) is a manufacturing strategy that produces products in a continuous and uninterrupted flow.

This is in contrast to traditional manufacturing methods, which often involve batch production.





ERP



ERP

[ˈē ˈär ˈpē]

A process used by companies to manage and integrate the important parts of their businesses, often via software to connect planning, purchasing inventory, sales marketing, finance, human resources, and more.



Gemba

Gemba refers to the actual place where work is performed. This can be the factory floor, the warehouse, or any other location where value is created.

Goal: Gemba walks is to understand the actual state of the workplace. This is done by observing the work being done, talking to the people who are working, & asking questions.

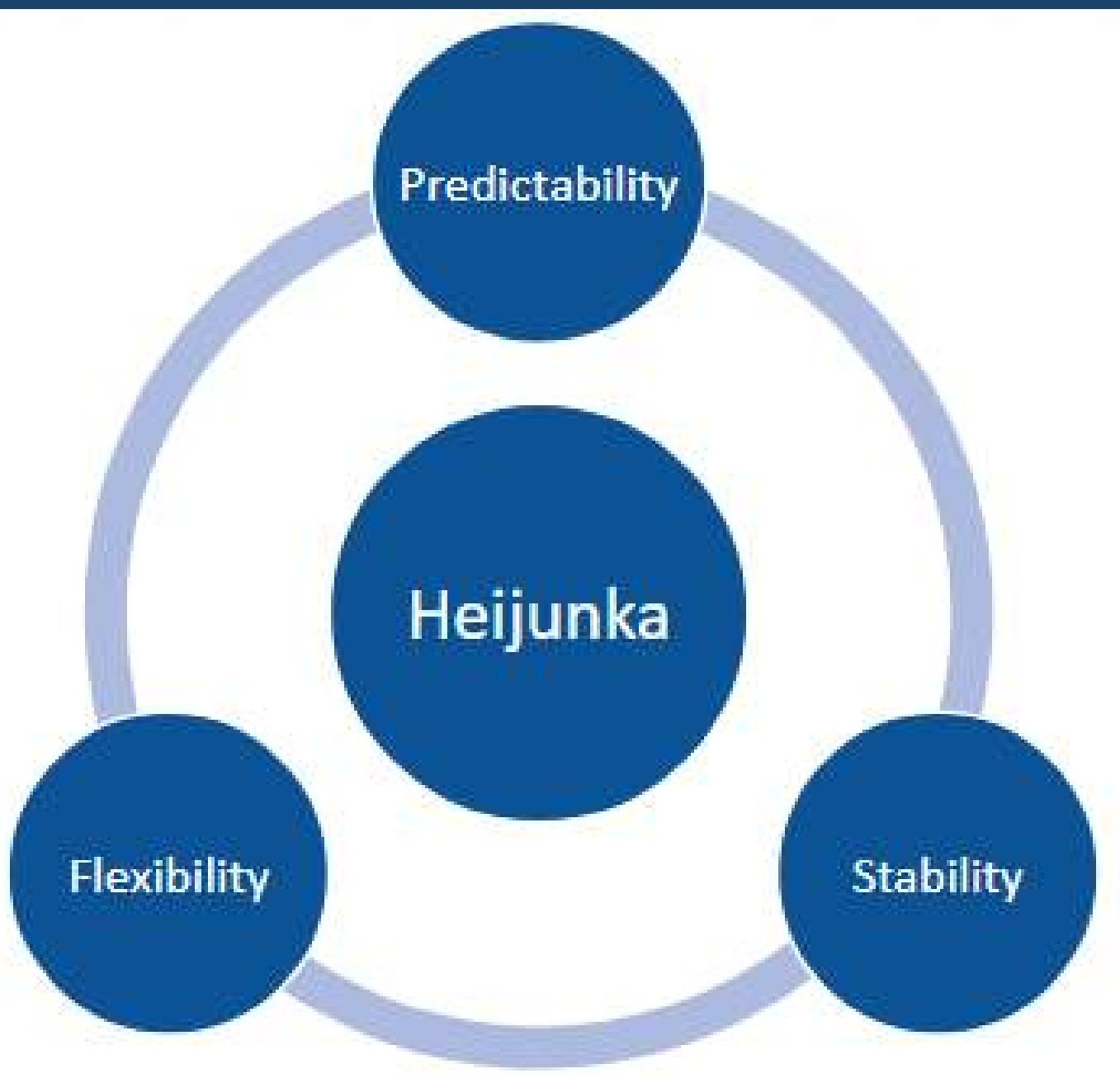




Heijunka

Heijunka refers to the practice of levelling production so that it is more uniform & predictable.

**Looking for ways to reduce waste?
Heijunka is a good place to start improving efficiency, and increasing predictability**



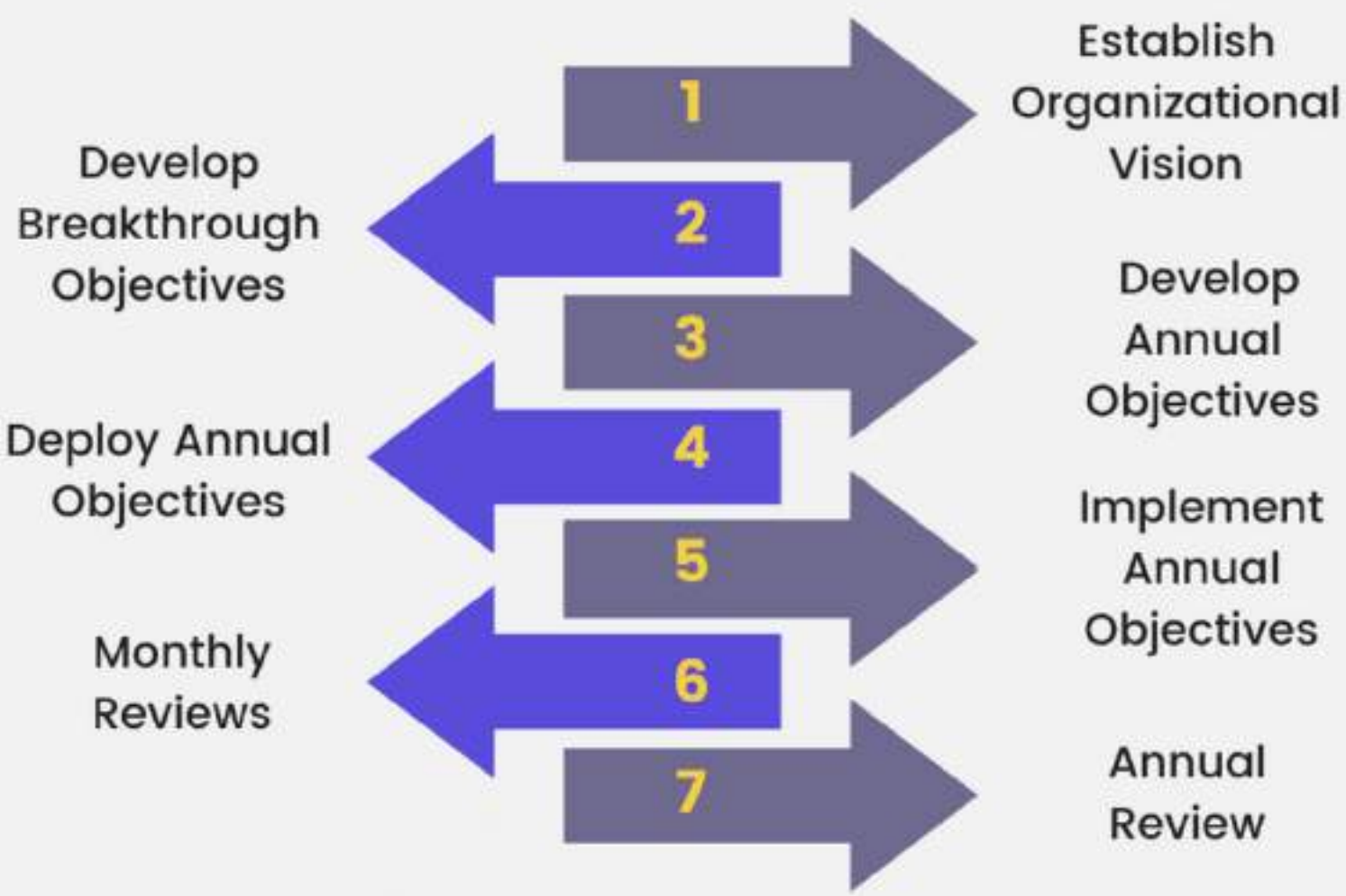


Hoshin Kanri

Hoshin Kanri ensure that all levels of an organization are working towards the same goals.

A great way to increase alignment, focus, efficiency, decision-making, and innovation within your organization

The 7 Hoshin Kanri Processes

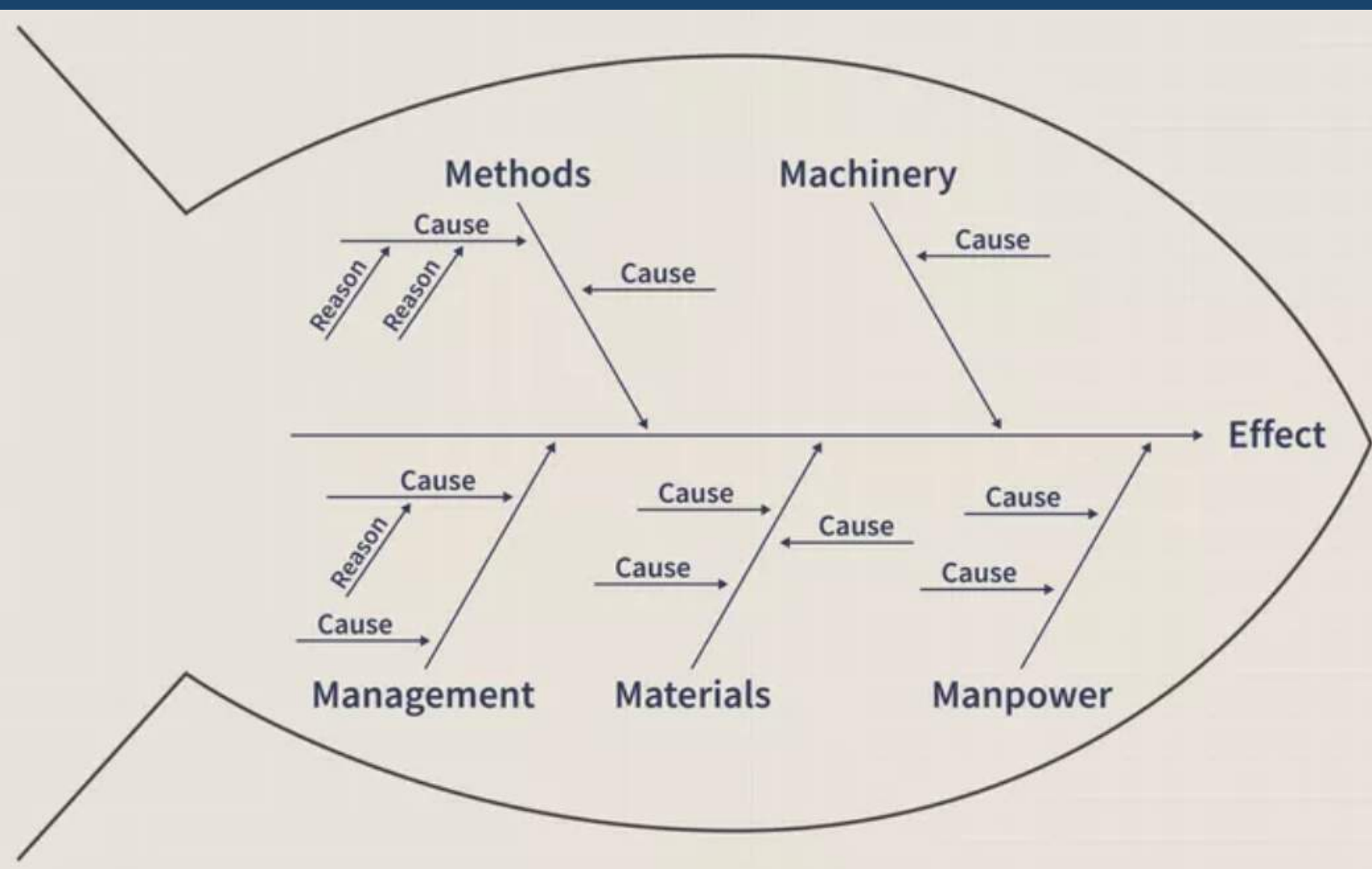


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Ishikawa

It is a visual tool that can be used to identify the root causes of a problem.

The main problem statement is then broken down into smaller problems, which are written on the "bones" of the fish. These smaller problems can then be broken down further into even smaller problems.



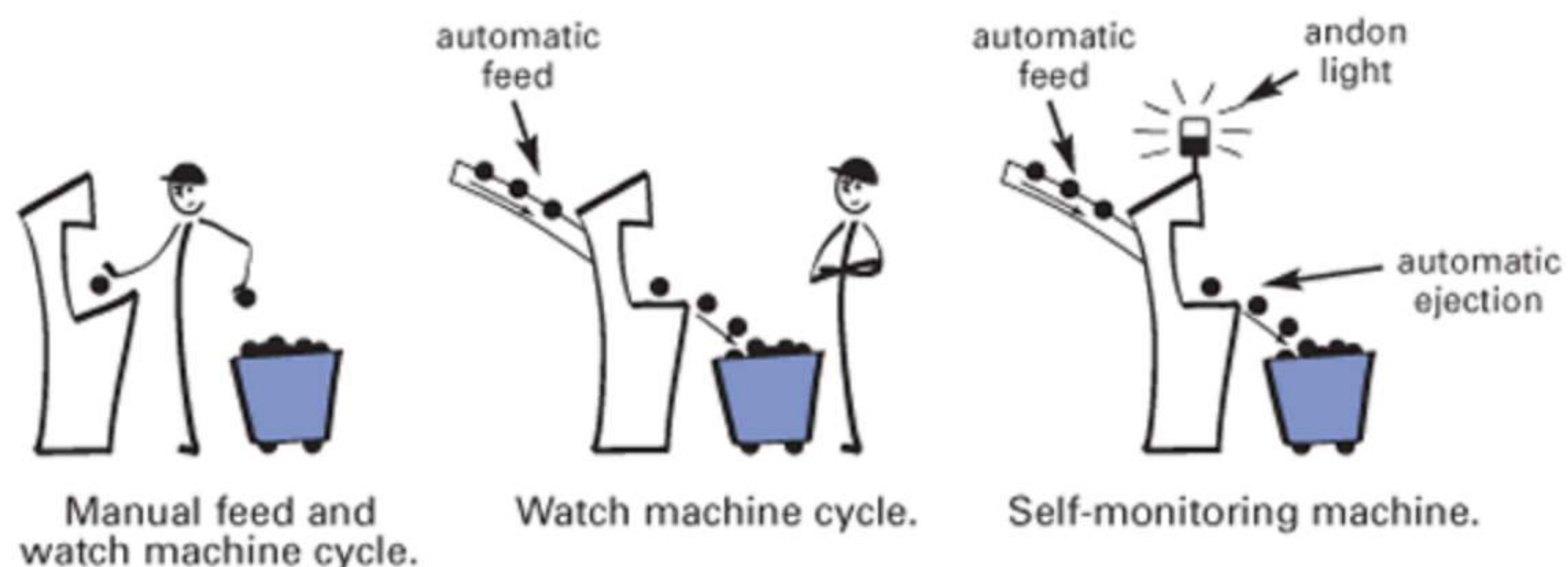
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Jidoka

This lean manufacturing principle aims to create a system where machines can stop themselves if they are not working properly.

This allows for the quick identification and correction of problems, which can help to improve quality, productivity, costs & safety.

The Evolution toward Jidoka



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Just-in-time (JIT)

It aims to deliver the right part at the right time in the right quantity to the right place.

JIT is a powerful lean manufacturing principle that can help to improve quality, productivity, and costs.



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Kaizen

It is a philosophy of continuous improvement that can be applied to all aspects of life, including manufacturing, business, and personal life.

The goal is to make small, incremental improvements on a regular basis which leads to significant improvements over time



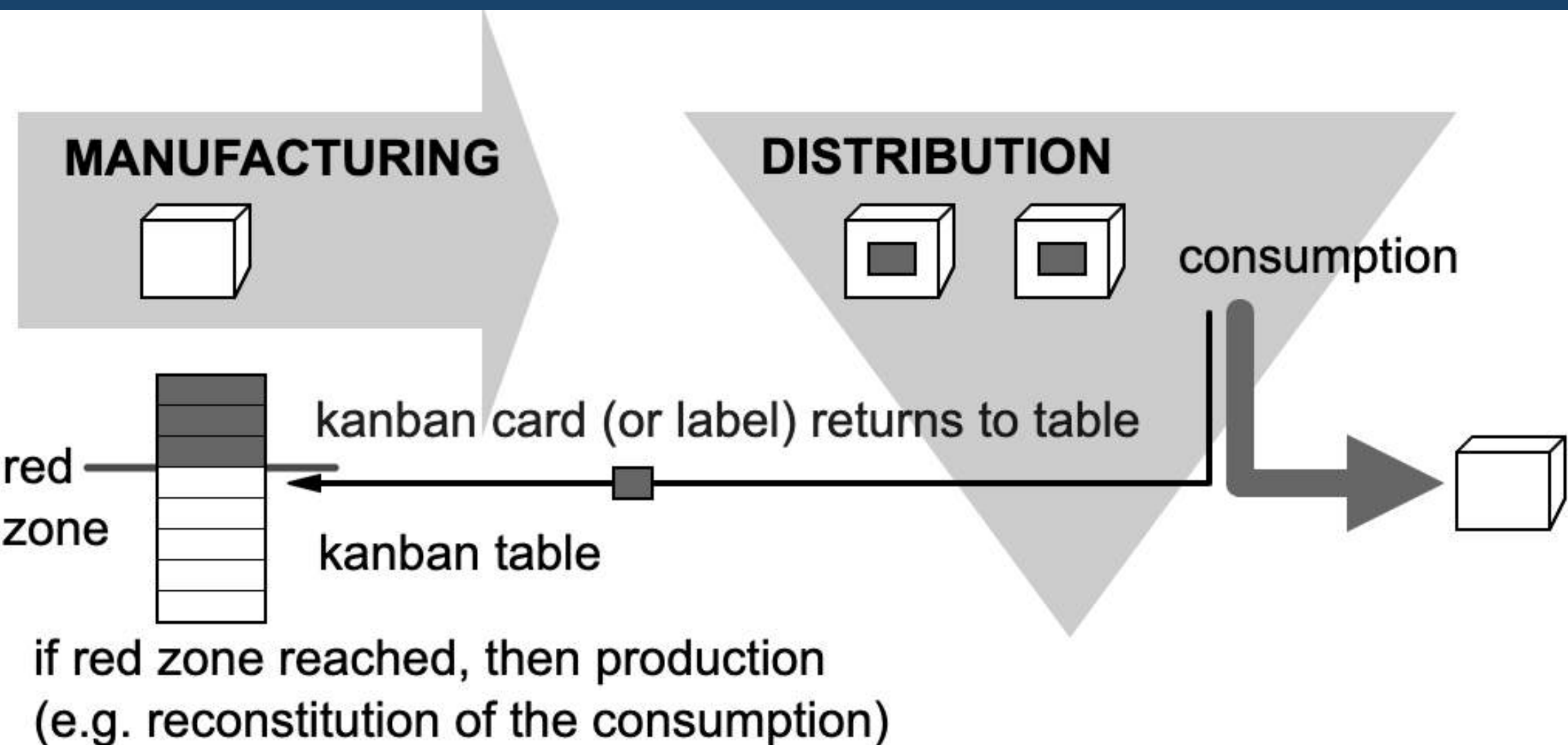
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Kanban

It is a visual management system that helps teams visualize their work, identify bottlenecks, and improve efficiency.

It is a pull system, which means that work is only pulled into production when it is needed.

This helps to prevent overproduction and waste.



They are used to measure the performance of a manufacturing organization

- **Help to track progress towards goals**
- **Helps identify areas for improvement**
- **Helps to allocate resources effectively**
- **Help to improve communication and collaboration**
- **Helps to improve communication and collaboration**

Most common KPIs include:

- 1. OEE**
- 2. Machine Utilization**
- 3. WIP**
- 4. Lead time**
- 5. Defect Rate**
- 6. Customer satisfaction**



Level Loading

A manufacturing technique that aims to equalize the workload of a production line by producing a steady stream of products at a consistent rate.

This can help to reduce waste, improve efficiency, and increase customer satisfaction.

Some of the benefits of using level loading:

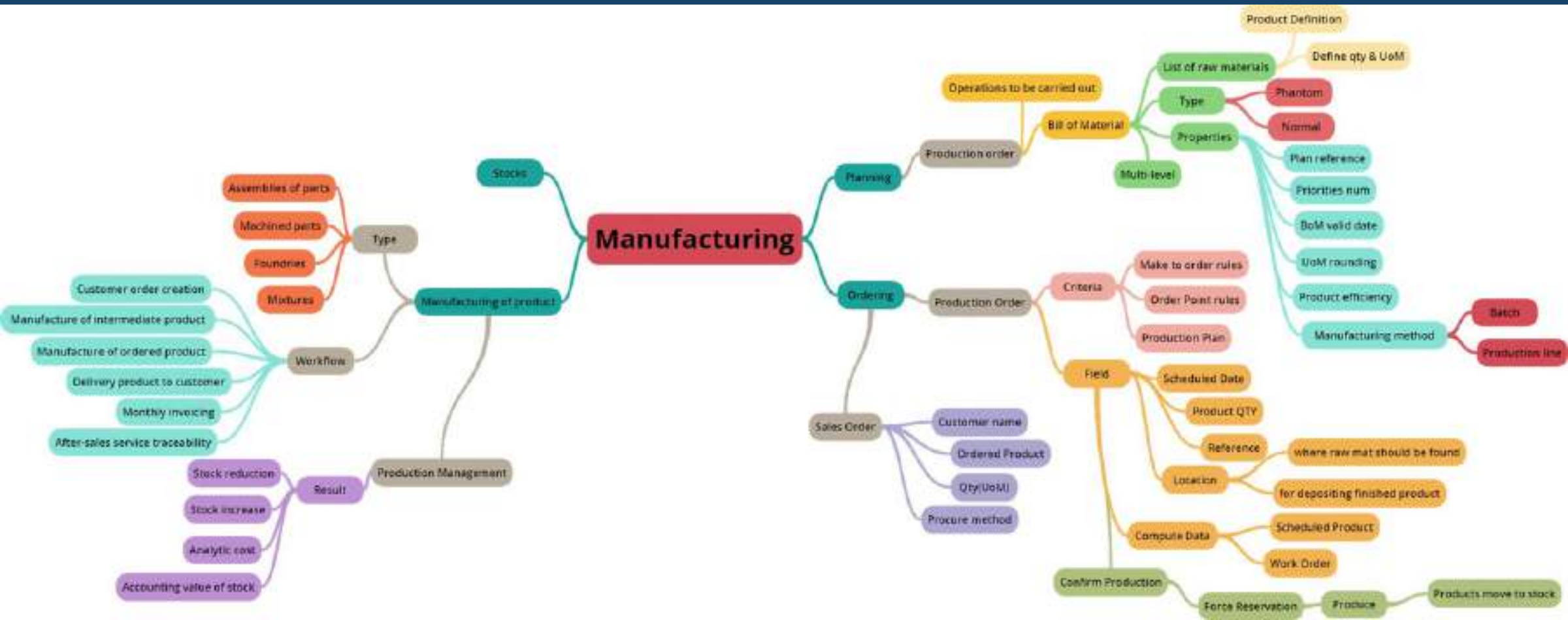
- **Reduced waste**
- **Improved efficiency**
- **Reduced costs**
- **Improved customer satisfaction**

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Mind Maps

A technique that uses a visual diagram to organize and represent information related to a manufacturing process.

It can be used to track the progress of a manufacturing process, identify potential problems, and brainstorm new ideas for improving efficiency or quality.



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Muda (Waste)

Muda refers to any activity that does not add value to a product or service.

Muda can be found in all aspects of manufacturing, from product design to production to distribution.



MOTION



INVENTORY



WAITING



DEFECTS

THE 7 WASTES



OVERPRODUCTION



TRANSPORTATION



OVERPROCESSING

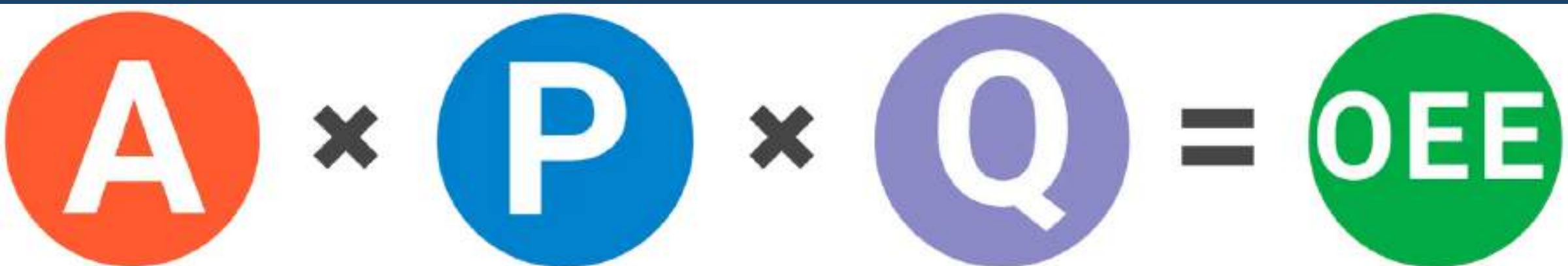
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Overall Equipment Effectiveness

It is a measure of how well a manufacturing plant is using its equipment.

OEE is calculated by multiplying three metrics: availability, performance, and quality.

$$\text{OEE} = (\text{Good Count} \times \text{Ideal Cycle Time}) / \text{Planned Production Time}$$



OEE is calculated by multiplying the three OEE factors: Availability, Performance, and Quality.

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PDCA (Plan, Do, Check, Act)

PDCA is a four-step process for continuous improvement & is used in a variety of fields, including manufacturing, business, & education.

The PDCA Cycle

SafetyCulture



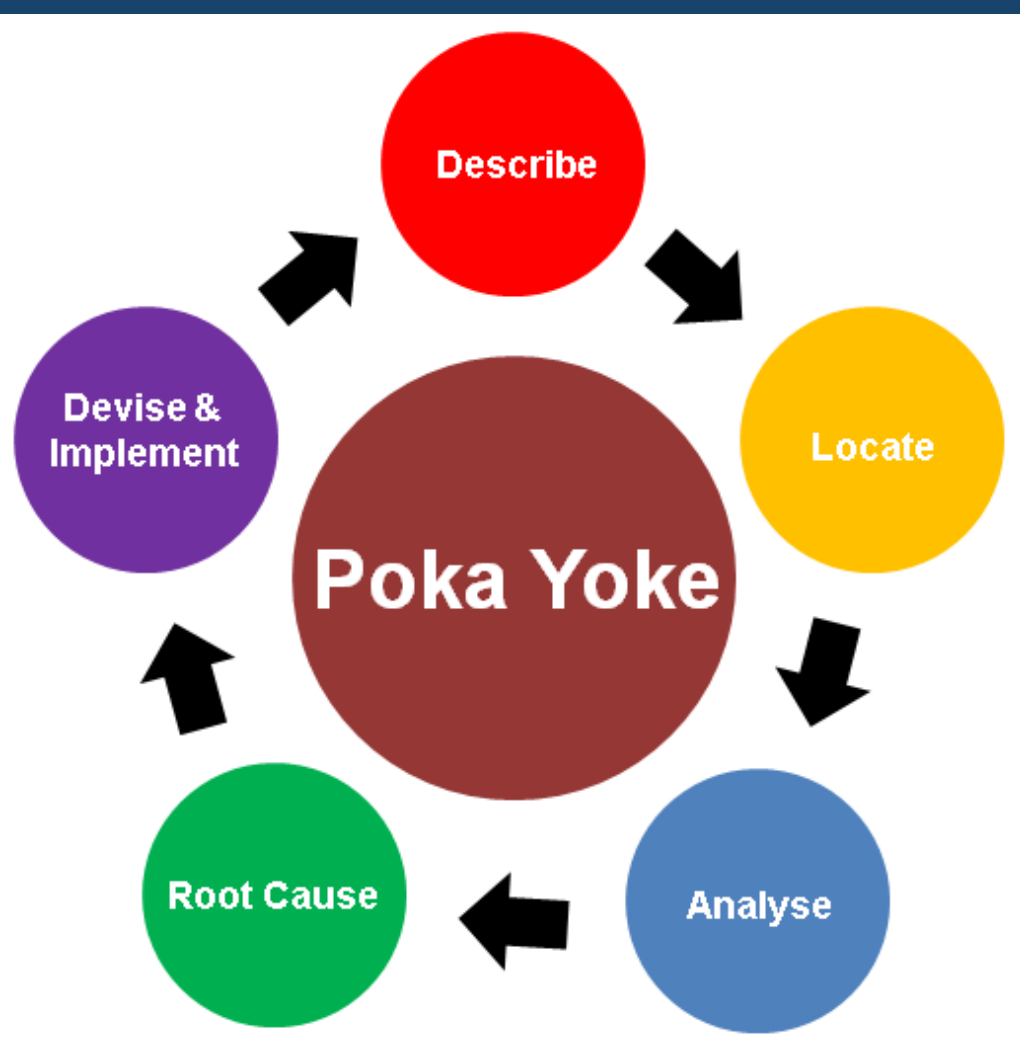
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Poka-Yoke (Error Proofing)

Poka-Yoke is a system of preventing mistakes or defects in manufacturing processes.

It can be used to prevent a wide variety of mistakes, including:

- Using the wrong parts
- Incorrect assembly
- Wrong measurements
- Damaged products



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Root Cause Analysis

Root cause analysis (RCA) is a process of identifying the underlying factors that contributed to an event or problem

By identifying and eliminating the root causes of problems, RCA can help to improve quality, reduce costs, improve safety, and increase customer satisfaction.

Root Cause Analysis Process



1 Realize the problem



2 Gather data



3 Determine possible causal factors



4 Identify the root cause



5 Recommend and implement solutions

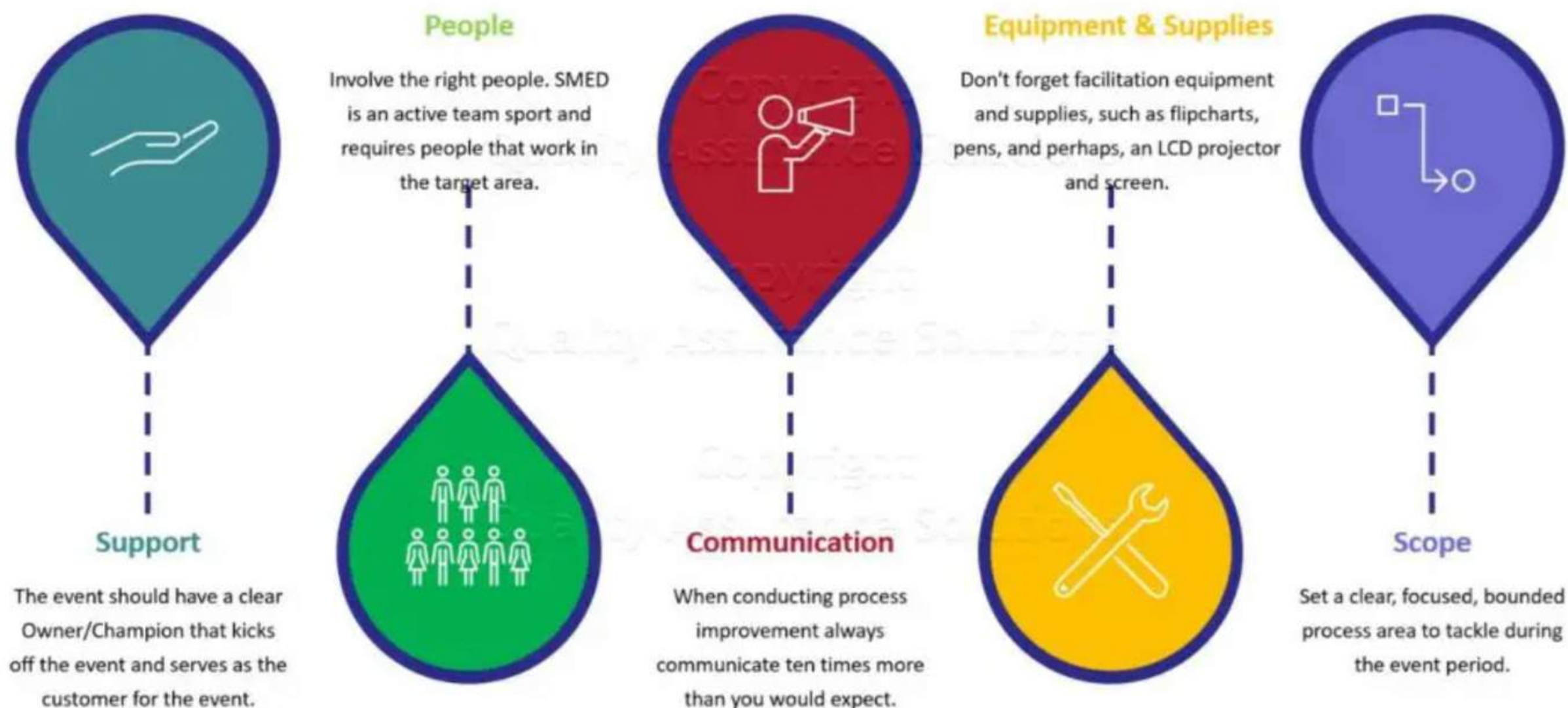
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Single Minute Exchange of Die

It is a manufacturing methodology that aims to reduce the time it takes to change a die in a manufacturing process.

The goal of SMED is to reduce the changeover time to less than 10 minutes.

Key Elements for SMED Event



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Six Big Losses

The Six Big Losses are a set of six manufacturing-related problems.

By implementing improvement strategies to reduce the Six Big Losses, manufacturers can improve productivity, reduce costs, improve quality, and enhance employee morale.



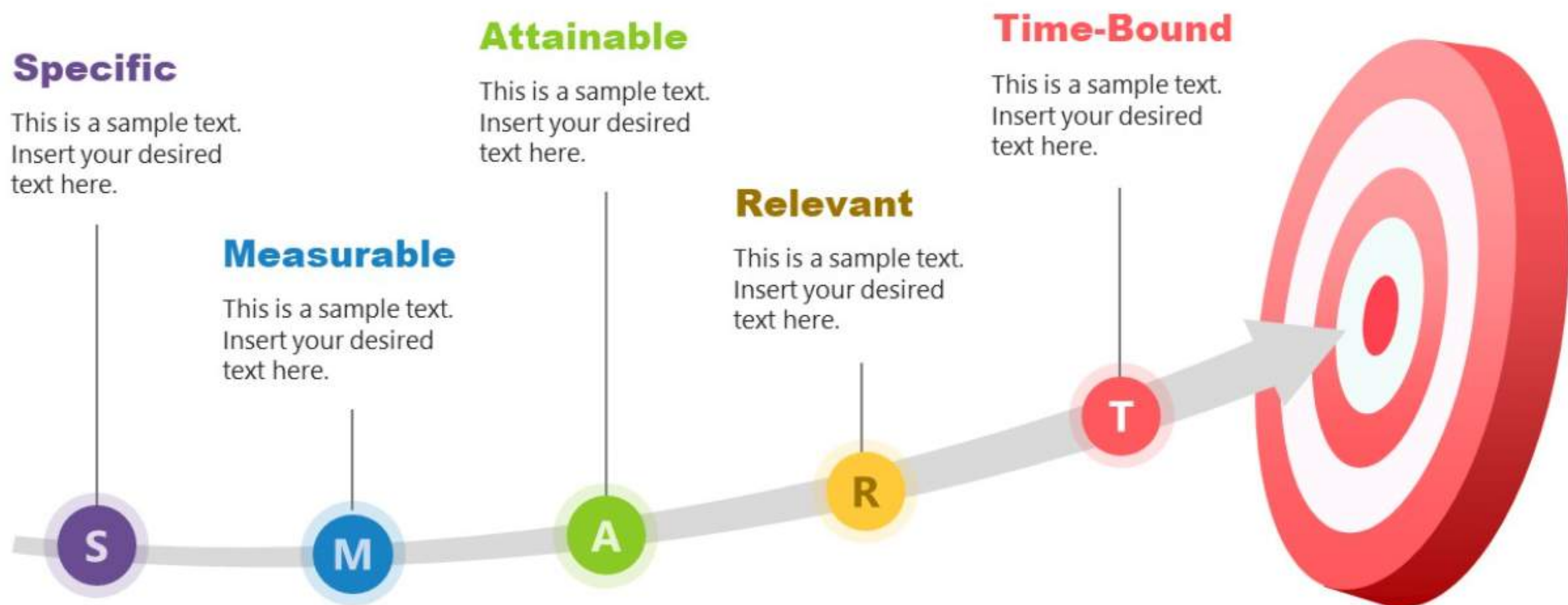
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SMART Goals

SMART goals are goals that are Specific, Measurable, Achievable, Relevant, and Time-bound.

They are a helpful way to set goals that are more likely to be achieved.

By setting SMART goals, one can increase their chances of achieving your objective





Standardized Work

It is a lean manufacturing term that refers to the process of defining and documenting the best way to perform a task.

Standardized work typically includes the following elements:

- **A description of the task**
- **The required tools and materials**
- **The cycle time**
- **The takt time**
- **The standard in-process inventory**
- **The standard quality standards**

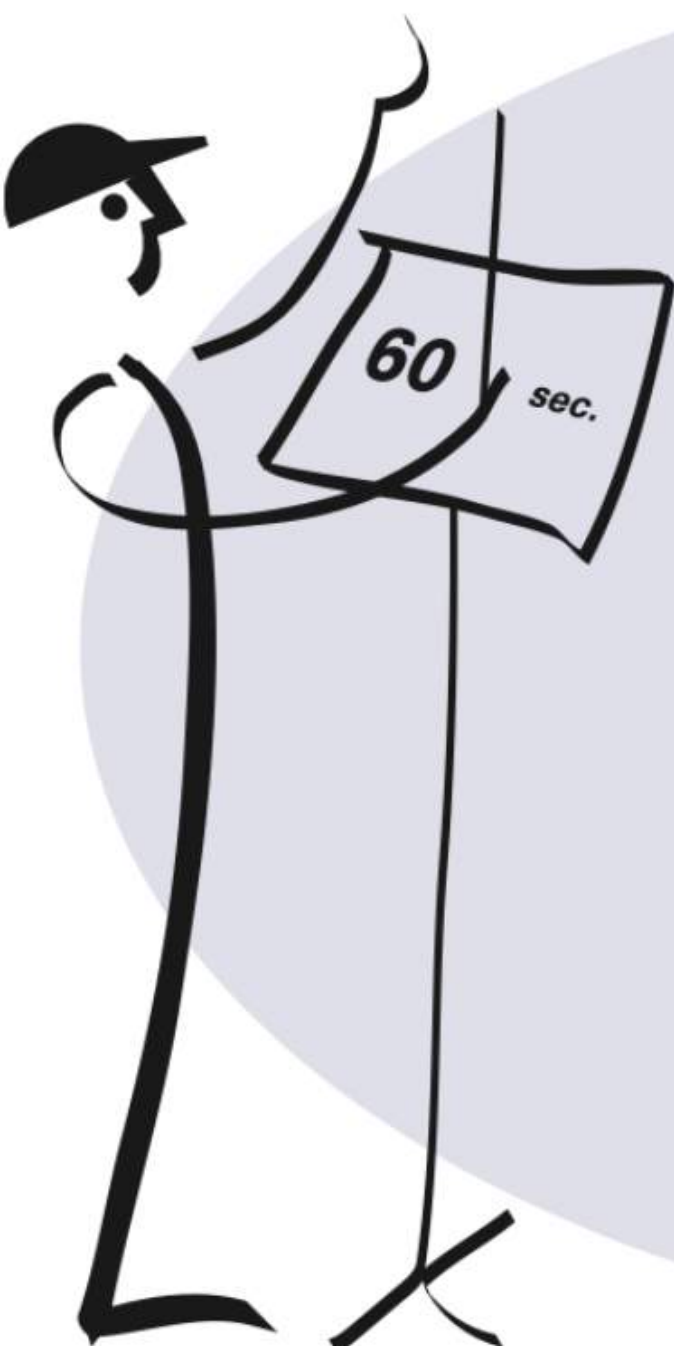
It is a valuable tool for improving efficiency, quality, and safety.

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Takt Time

Takt time refers to the pace at which products are needed.

By understanding takt time and taking steps to improve it, companies can produce more products in a given amount of time, reduce waste, and improve customer satisfaction.



$$\text{takt time} = \frac{\text{available production time per day}}{\text{customer demand per day}}$$

$$\text{example: } \frac{27,600 \text{ sec.}}{460 \text{ pieces}} = 60 \text{ seconds}$$



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Total Productive Maintenance

TPM aims to improve the reliability AND performance of equipment.

By implementing the key elements of TPM, companies can achieve significant benefits, such as reduced downtime, increased availability, improved performance, and reduced costs.



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Value Stream Mapping

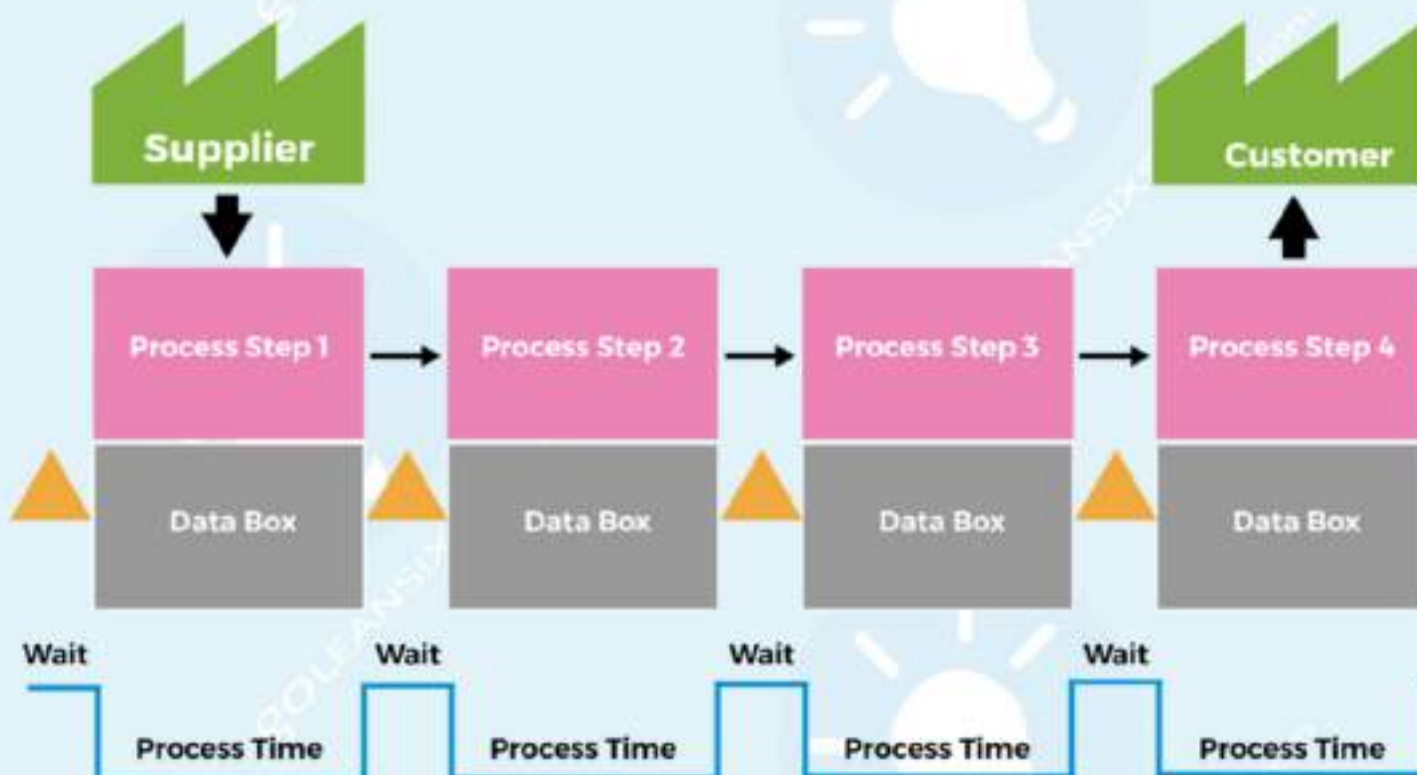
VSM uses a visual diagram to map the flow of materials and information through a process.

The goal of VSM is to identify and eliminate waste in the process.

VSM is a valuable tool for any company that wants to improve its efficiency, quality, and customer satisfaction.

Value Stream Map

A Value Stream Map displays the high level process steps along with key process data.



Zero Quality Control

It aims to achieve zero defects by preventing mistakes from happening in the first place.

ZQC is based on the following principles:

- **Design for quality: Designing products & processes that are less likely to produce defects.**
- **Prevention: Focus on preventing defects from happening, rather than on detecting & correcting them after they occur.**
- **Employee involvement: Active participation of all employees in the quality process.**
- **Continuous improvement: ZQC is a continuous improvement process that is always looking for ways to improve quality**

Visual Factory

It uses visual tools to improve communication and visibility in the workplace.

Visual Factory is based on the following principles:

- **Visibility:** Make information easily accessible to everyone in the workplace. Using signs, labels, and other visual aids to communicate information about the status of work, quality & other important aspects of the production process.
- **Communication:** Effective communication between all employees in the workplace. This includes communicating about problems, solutions, and other important information.
- **Continuous improvement:** A continuous improvement process that is always looking for ways to improve communication and visibility in the workplace.