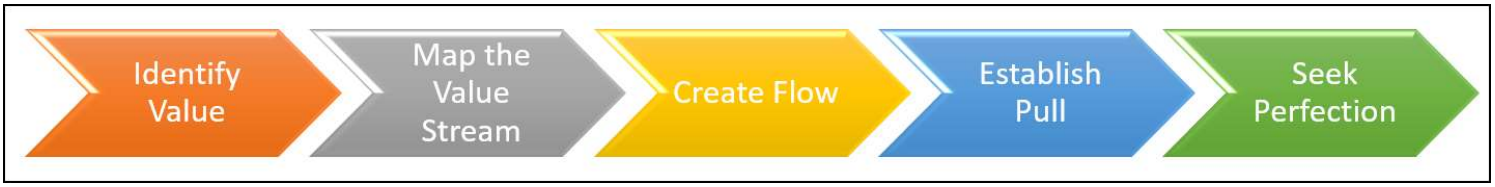
Lean Principles in the Organization

The 5 Core Principles of Lean

Womack and Jones expanded on *The Machine That Changed the World* with their 1996 book ***Lean Thinking*** where they created the **5 Core Principles of Lean Production**:

1. **Identify Value**
2. **Map the Value Stream**
3. **Create Flow**
4. **Establish Pull**
5. **Seek Perfection**



Let's review each of these 5 core principles now, as they truly lay the foundation for many of the tools below.

Core Principle #1 - Value

The first core principle of Lean is to **identify the value for the customer**.

Value is inherently defined by the customer. A feature or characteristic of your product is not valuable unless the customer is willing to pay for it.

Therefore, the first step in lean thinking is to define value in the eyes of the customer.

The price of your product is based on the value you provide and what the customer is willing to pay. This ultimately determines the cost you can charge for your product. Organizations can then focus on eliminating waste to improve their profit margins.

Understanding what your customer finds valuable allows you to identify and eliminate waste in your product or process.

Core Principle #2 – The Value Stream

Once you understand the value associated with your product, process or service, you must then work to understand the **value stream**.

The **Value Stream** is the **sum total of the entire lifecycle of your product** from raw material all the way to final consumption and disposal by the customer.

Focusing on the entire Value stream ensures that you are able **to achieve maximum value and eliminate waste**. This big picture perspective ensures that every step in the process is examined for waste.

Below we will discuss a tool called the Value Stream Map that accomplishes this very task.

Core Principle #3 – Flow

The **3rd core principle of Lean** is that **value should flow through the value stream without delay** or interruption.

Flow is achieved when lean practitioners are able to sync all steps in the production process in pursuit of a JIT (Just In Time) manufacturing.

Achieving a smooth, consistent flow is the key driver of many Lean tools including **Takt Time, SMED, Kanban and JIT**.

Core Principle #4 - Pull

The 4th core principle of lean is that **value should be pulled through the value stream at the demand of the customer**.

Building product before the customer demands it (buys it) is a form of **over-production (Waste)** that results in other forms of waste in Inventory, and can disrupt the flow of material through the production process.

Therefore, in a truly lean production system**, nothing is produced until the customer (internal or external) pulls it through the system**.

This **Pull System** should consist of a **continuously flowing process** where materials move through the value stream at the rate equal to the customer demand (**Takt Time**) in a smooth and uninterrupted sequence.

The Pull System is the opposite of a push system where materials are produced to a forecast and are held as inventory (waste of inventory) until they are needed.

Value can be pulled through a system using lean tools like a Kanban, which will be discussed below.

Core Principle #5 – Continuous Improvement

The 5th and final principle of the Lean Production System is to **continuously improve toward perfection**.

This core principle is why Lean Manufacturing is synonymous with Continuous Improvement and most lean practitioners are very familiar with the tools of Kaizen, 7 QC Tools, and other **Continuous Improvement Methodologies**.

Part 2 – The 8 Major Lean Tools

Okay, let's switch gears and review the following 8 major Lean Tools which are meant to achieve the 5 core lean principles:

- The 8 Deadly Wastes (Muda)
- 5S
- The Value Stream Map
- Kanban
- Visual Control
- Standard Work
- Takt Time
- Single Minute Exchange of Die (SMED)

8 Wastes (Muda) in Lean

Perhaps the biggest miss-conception about lean is that **lean is all about Waste**.

This is not true, lean is about value, but **waste is the opposite of value,** which is why many lean practitioners focus heavily on the **identification and elimination of waste**.

As lean originated in Japan as part of the Toyota Production System, waste is commonly called by its original Japanese name, **Muda**.

Muda (Waste) is defined as **any activity that consumes resources but creates no value for the customer**.

Taiichi Ohno defined the 7 Deadly wastes in his work with Toyota, and since then **an 8th waste** has been added, the waste of **non-utilized talent**.

To remember the 8 forms of waste All you have to do is remember **DOWNTIME**.

Defects

Products that don't meet the customers needs or function as intended are clearly a form a waste. Building a unit that doesn't meet specification is clearly a waste of your time, effort, resources and material.

Similarly, products that require rework because they were not produced correctly the first time are a form of waste. Tools like **Poka-yoke, Jidoka, standard work and root cause analysis** can be used to reduce or eliminate defects.

Over-Production

Over-production is defined as the **production of material before it is needed**.

Over-production is often considered the worst form of waste because it leads to other forms of waste including inventory, motion, transportation, etc.

The waste of over-production is often remedied by a pull system like a **Kanban** that ensures **value only flows at the pull of the customer (Takt Time**), or a **SMED project** to reduce setup times to allow for small batch sizes (or single piece flow).

Waiting

The waste of waiting occurs when production assets are forced to wait due to poor flow or any other issues within the value stream.

Anytime a resource must wait due to an unbalanced or out-of-sync process, the production flow is interrupted and the waste of waiting occurs resulting in lost productivity and the inability to meet the customer demand.

Using **standardized work** can improve the consistency of flow and time are achieved for each step to reduce the waste of waiting. SMED projects can also be used to improve change-over times and reduce the waste of waiting.

Non-Utilized Talent

An organizations biggest resource is its human resource. When people's talents go under-utilized, the organizations biggest asset goes under-utilized.

This is the newest and 8th form of waste, which is the waste of non-utilized talent. This goes back to the concept of lean being fundamentally a people process.

This form of waste is address through the engagement of all associates in continuous improvement and the development of people through skill building and **training**.

Transportation

Remember, value is something that a customer is willing to pay for. When we think about things like transportation from that perspective it's easy to see why transportation is a form of waste.

Customers don't care that you need to move material from one side of the country to another, or from one warehouse to another, or from one side of your production floor to another.

This is why the unnecessary transportation of materials is considered waste – because the customers are not interested in paying for it.

Certainly, some transportation will always be necessary, but any unnecessary transportation is simply waste.

The tool of **value stream mapping** can highlight the waste of transportation, and the placement of equipment and manufacturing locations near each other can eliminate the waste of transportation.

Inventory

The waste of inventory is any material that are not needed to support the immediate production need of meeting the demand of the customer.

Similar to transportation, customers don't care about inventory – especially inventory that's not needed to fill a customer need. This could include inventory of raw materials, supplies or finished goods.

Inventory always requires extra space, extra transportation and extra effort to manage which is why having any unnecessary amounts of inventory is wasteful.

Kanban systems are often used to control inventories and ensure they are appropriately sized.

Motion

Transportation is the waste associated with the unnecessary movement of materials.

The human analogy to this is the **waste of motion** which is the unnecessary movement of people that does not add any value.

Excess motion can also increase the **risk of a safety issue** for employees if they're required to travel unnecessary distances, lift heavy objects, bend awkwardly reach to far or repeat motions unnecessarily. Making this waste even nastier.

Tools like 5S can ensure that your work-place is organized to eliminate unnecessary motion.

Also, a spaghetti diagram can be used to explore the motion within a production process to identify excess motion, and allow for the re-arrangement of a production process of improved flow.

Extra-Processing

Extra-processing, also commonly called over-processing is the waste that occurs when you put in more effort, time or work into a production step than what is needed.

This might include grinding, polishing and painting a component that your customer would simply be okay just grinding.

This might also look like a 200% visual inspection because your process isn't capable of reliably producing good parts.

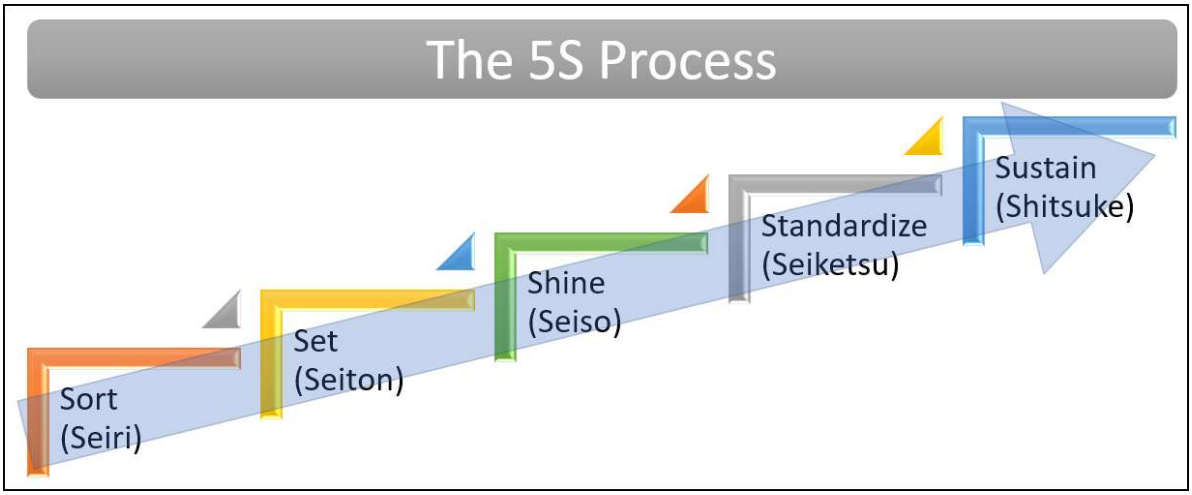
5S

While waste is often the #1 focus of lean practitioners**, 5S is often the most utilized tool within Lean**.

5S is a workplace organization tool meant to organize, clean and standardize a workplace.

There are 5 S's within 5S, which define the 5-step process to the 5S tool, these include:

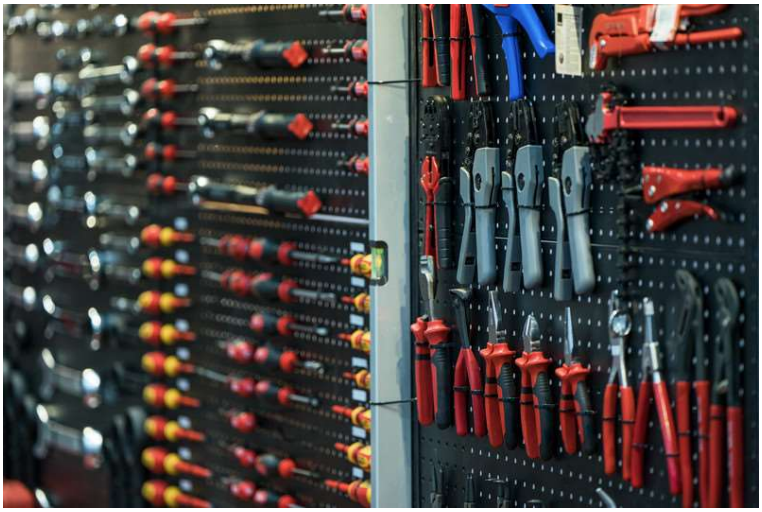
- **Seiri** (**Sort**) – Eliminate that which is not needed
- **Seiton** (**Set**) – Organize the remaining Items near point of use for ease of use
- **Seiso** (**Shine**) – Clean and inspect the work area
- **Seiketsu** (**Standardize**) – Create standards for previous 3 steps to ensure daily activity
- **Shitsuke** (**Sustain**) – Regularly apply the 5S standards above



Having an **organized workplace** is often the first step in **identifying and eliminating many of the 8 deadly wastes** – particularly motion, waiting and transportation. In addition to making waste visible, 5S results in an organized, uncluttered, **safe work environment**.

In fact, **5S** has proven itself as such a useful tool to improve safety that 5S is often called 6S with the last S being a focus on **safety**.

5S is a great example of a **visual control tool**. Many 5S practitioners will utilize shadow boards, signal, floor tape and other tools to standardize the work and sustain the 5S program.



Kanban

During the development of the Toyota Production System, Toyota engineers like Taiichi Ohno visited the U.S. and visited a supermarket, which was the inspiration for the modern day kanban.

Ohno noticed that the supermarkets were able to keep their shelves stocked by replenishing empty locations with inventory from the back of the supermarket, and then only re-ordering material that has been consumed.

This was able to keep the shelves stocked while also keeping inventory low and the food on the shelf fresh.

Ohno and others wanted to emulate this approach within Toyota to ensure they only produced items that were consumed by downstream items.

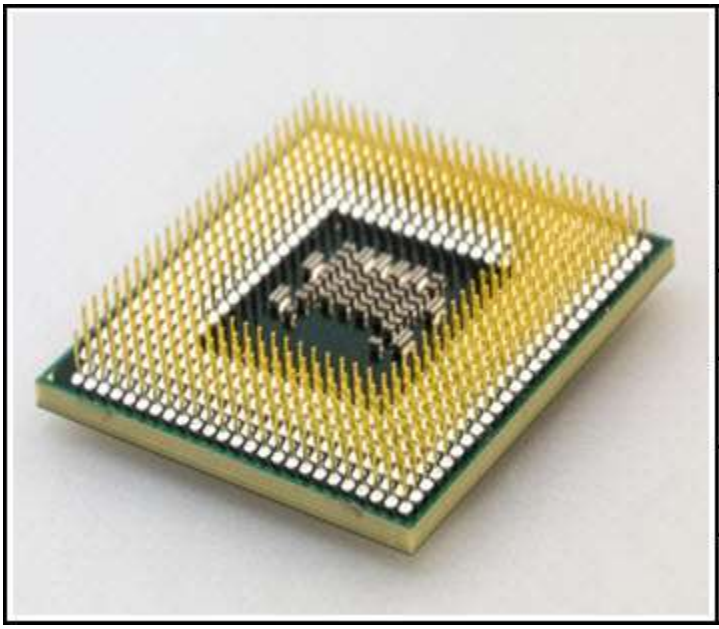
To accomplish this, Ohno created **kanbans** to indicate when a "shelf" in the supermarket is empty as a sign to the upstream process to produce the needed item.

The word Kanban (pronounced kahn-bahn) translates into English as a **signboard** or **signal**, and it is used to **communicate** the **need to start or stop producing** an item.

The Kanban is used to create a pull system to ensure production only occurs at the pull of the customer.

The method of a kanban ensures material is only produced when it's needed and thus limits inventory and ensure that value is pulled through a system instead of pushed.

Kanbans are always facilitated by a **visual signal** – this is often a **cart, bin or kanban card** which all serve to **communicate** that production of a particular item must occur.



Part Description	Computer CPU
Part Number	10-20-1001
Vendor	ACME Computer Parts
Vendor Part Number	614285
QTY	100 Eaches
Card	1 of 2
Location	Warehouse

Additionally, because a kanban system limits inventory, if there are any **issues that interrupt the flow of material**, these issues will be quickly identified as opportunities for improvement (kaizen).

As processes are improved, kanban inventory levels can be reduced to further eliminate waste in order to achieve single piece flow.

This leads us to our next lean tool, which is that of **visual control**.