Lean Six Sigma Green Belt Certification Course

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Lean Principles in the Organization

Learning Objectives

By the end of this lesson, you will be able to:

- Define Lean
- Explain the theory of constraints
- Describe value stream mapping

Scenario

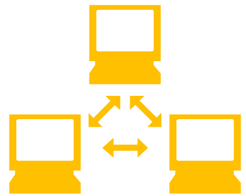
ZARA is one of the world's most valuable fashion retail brands, worth $9.4 billion.

Lean Business Model

Hold Low Stock

Update Collections Twice a Week

Data from 2,000 stores in 88 countries



Sent to distribution center

Designers analyze the data and take actions

DIGITAL OPERATIONS

Lean Concepts

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What Is Lean?

Lean refers to creating more value to customers with fewer resources.

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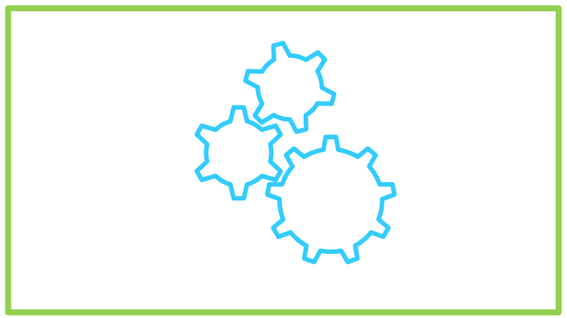
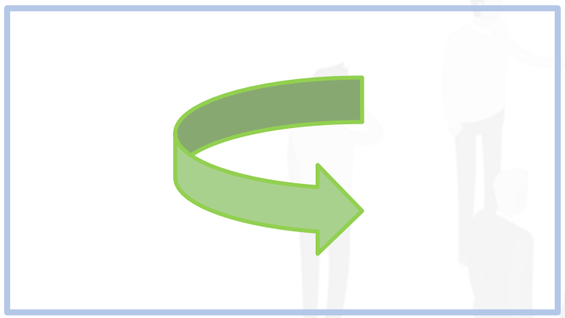
=

Zero Waste

Optimizing the Process



Eliminating NVAs



Increasing Flow

If ‘Quality’ is the word to describe Six Sigma, then ‘Speed’ is the word to describe Lean.

Benefits of Lean

- **Reduce Cost**
- **Reduce Cycle Time**
- **More Throughput**
- **Increase Productivity**

MYTH

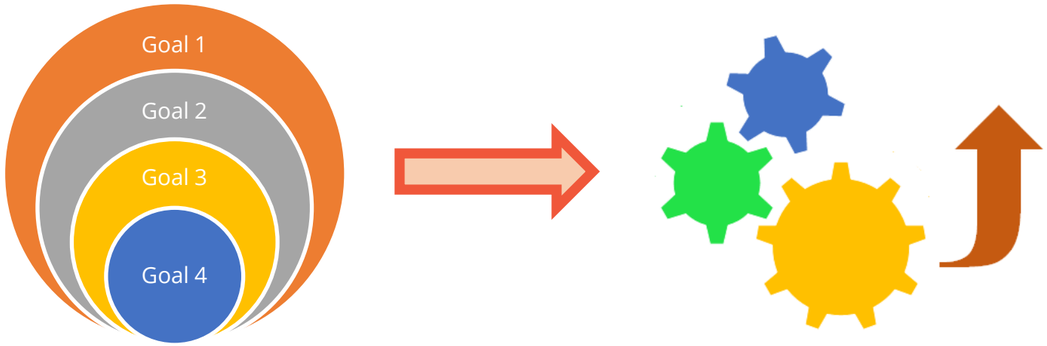
Lean can only be applied in manufacturing areas

TRUTH

Lean concepts can be applied in any business and in any process

Lean vs. Six Sigma

Lean and Six Sigma – 2 different principles – 1 powerful CI methodology



Lean

Efficiency

- ✓ Identifying value
- ✓ Removing unnecessary steps
- ✓ Improving speed

Six Sigma

Effectiveness

- ✓ Breakthrough processes
- ✓ Identifying root cause
- ✓ Variation reduction

6σ

6σ

Lean Six Sigma

Business Improvement

Transformation

History of Lean

1450s

Various forms like flow interchangeable parts, automatic assembly line , automatic defect detection, etc.

1913

Henry Ford fully integrates the entire production process

1930

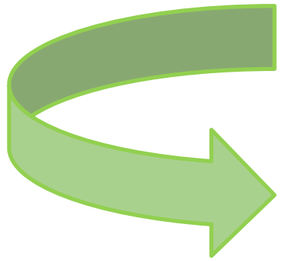
Toyota's Kiichiro Toyoda and Taiichi Ohno invents the TPS

The term "Lean" was coined by James P Womack in the book "The Machine that Changed the World".

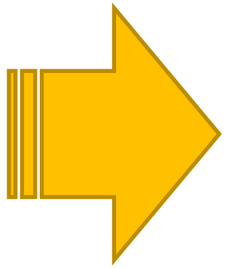
Principles of Lean

Identify Value

Map the Value Stream



Create Flow



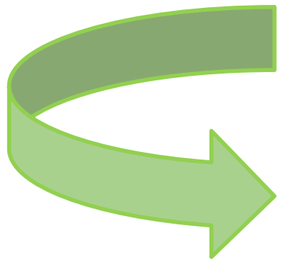
Enable Pull

Seek Perfection

Principles of Lean

Identify Value

Map the Value Stream



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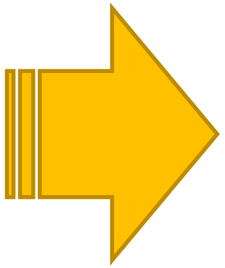


Enable Pull

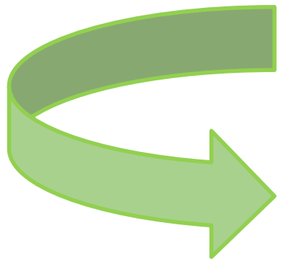
Seek Perfection

Identify the end customer for a product or service.
Know how the customer perceives the products or the service.

Principles of Lean

Identify Value

Map the Value Stream



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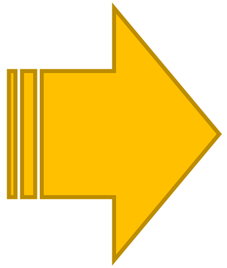


Enable Pull

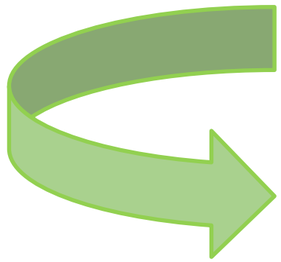
Seek Perfection

Visualize the flow of the end-to-end process

Principles of Lean

Identify Value

Map the Value Stream



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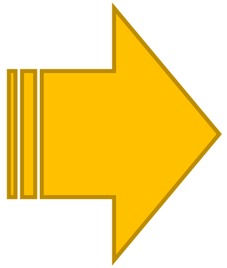


Enable Pull

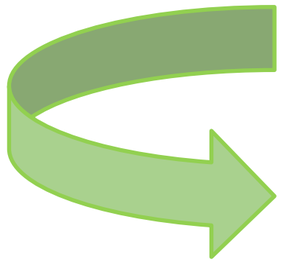
Seek Perfection

Flow is created by minimizing the frequency of stopping and starting

Principles of Lean

Identify Value

Map the Value Stream



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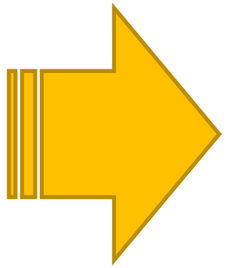


Enable Pull

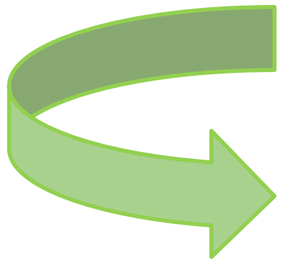
Seek Perfection

Products and services are not rendered till customers have placed an order

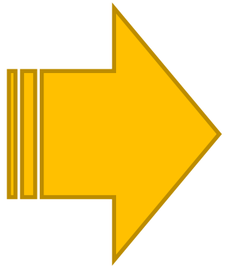
Principles of Lean

Identify Value

Map the Value Stream



Create Flow



Enable Pull

Seek Perfection

Achieve the complete elimination of waste

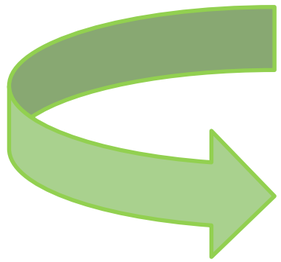
Principles of Lean

Identify Value

Identify the requirement of the customer from a smart watch

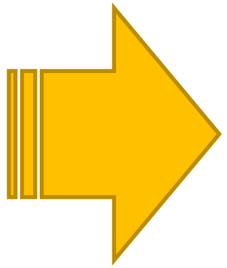
Map the Value Stream

Visualize the flow of the smart watch manufacturing process



Create Flow

Address process elements to complete orders quickly



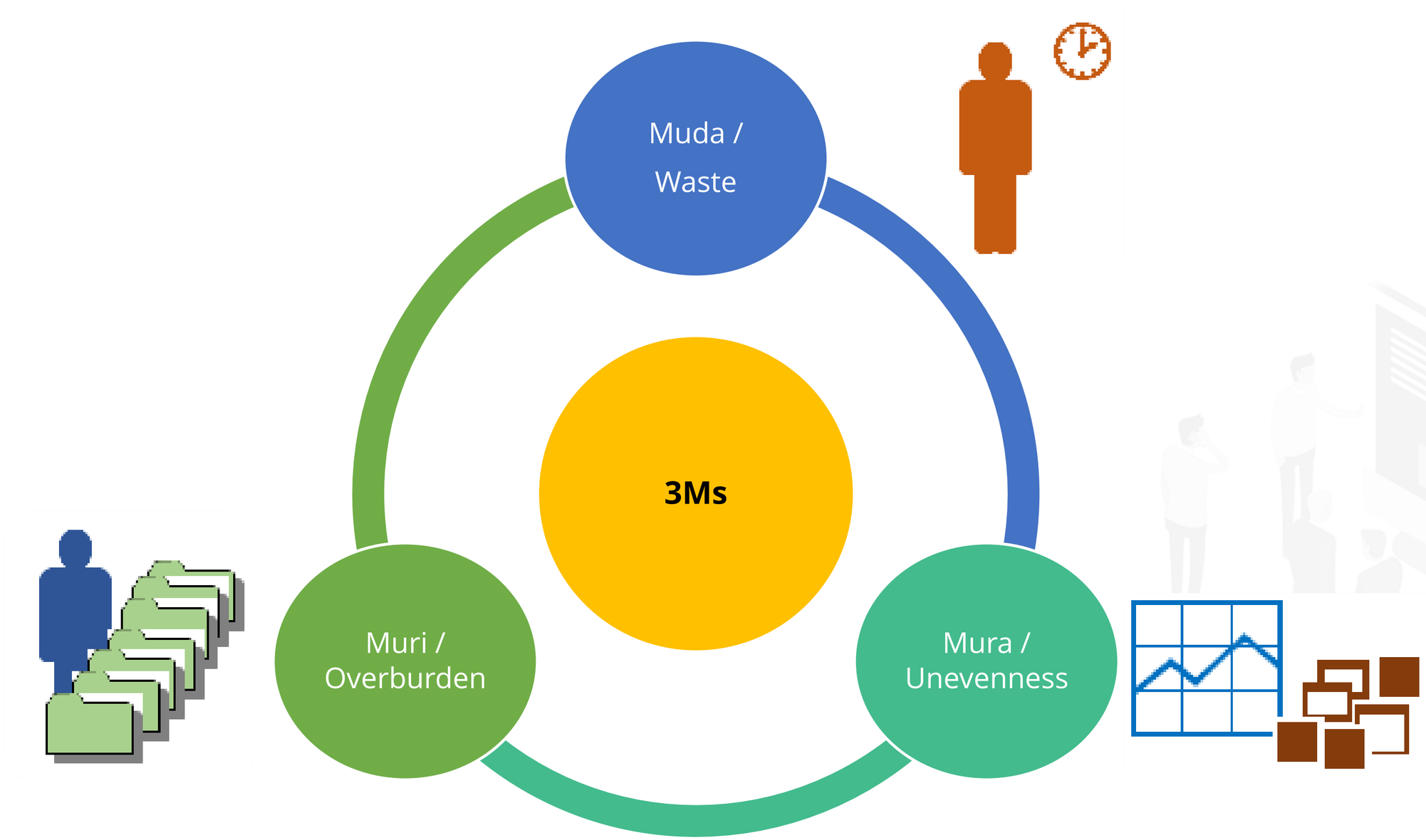
Enable Pull

Order smart watches only when required

Seek Perfection

Improved processes to better identify customer needs

3 Ms of Lean



The Lean Wastes

Waste or muda refers to anything in the process that does not add value for the customers.

D O W N T I M E

The Lean Wastes

D O W N T I M E

Defect/Repair/Mistakes

Efforts caused by rework, scrap, and incorrect information

- ✓ Rework or scrap
- ✓ Poor quality material fit

- ✓ Shipping package to wrong address
- ✓ Providing wrong service to client

- ✓ Not ordering the correct labs
- ✓ Patients receiving a misdiagnosis

The Lean Wastes

D O W N T I M E

Overproduction

Producing more than what customers need or producing too soon

- ✓ Producing 10 products when 5 were needed
- ✓ Large batch sizes

- ✓ Duplication of effort

- ✓ Delayed discharges
- ✓ Unnecessary diagnosis procedures

The Lean Wastes

D O W N T I M E

Waiting

The wasted time in waiting for the next step in a process

- ✓ Idle time and delays
- ✓ Long change overs

- ✓ Meetings overrun
- ✓ Customers on hold

- ✓ Waiting for lab results
- ✓ Patients waiting in emergency department

The Lean Wastes

D O W N T I M E

Non-Utilized Resources

When employees are not engaged/supported or there is a mismatch of talent

- ✓ Unused resources

- ✓ Ambiguous roles and responsibilities
- ✓ Wrong resource allocation

- ✓ Lack of sharing of ideas to improve

The Lean Wastes

D O W N T I M E

Transportation

The unnecessary transportation of products

- ✓ Moving finished goods to warehouse instead of shipping department

- ✓ Unnecessary hand-offs and loop backs
- ✓ Shipping hard copies that need signatures

- ✓ Moving patients from room to room
- ✓ Moving information by email

The Lean Wastes

D O W N T I M E

Inventory

Excessive finished or intermediate goods stored

- ✓ Buffer and safety stock inventory
- ✓ Material between operations

- ✓ Invoices waiting to be paid
- ✓ Excessive multi-tasking

- ✓ Overstocked consumables/supplies

The Lean Wastes

D O W N T I M E

Motion

More than required movement by people to complete a task

- ✓ Bending and twisting by operators

- ✓ Looking and searching for data

- ✓ Looking for materials and equipment
- ✓ Nurses walking from station to patients room

The Lean Wastes

D O W N T I M E

Excessive Processing

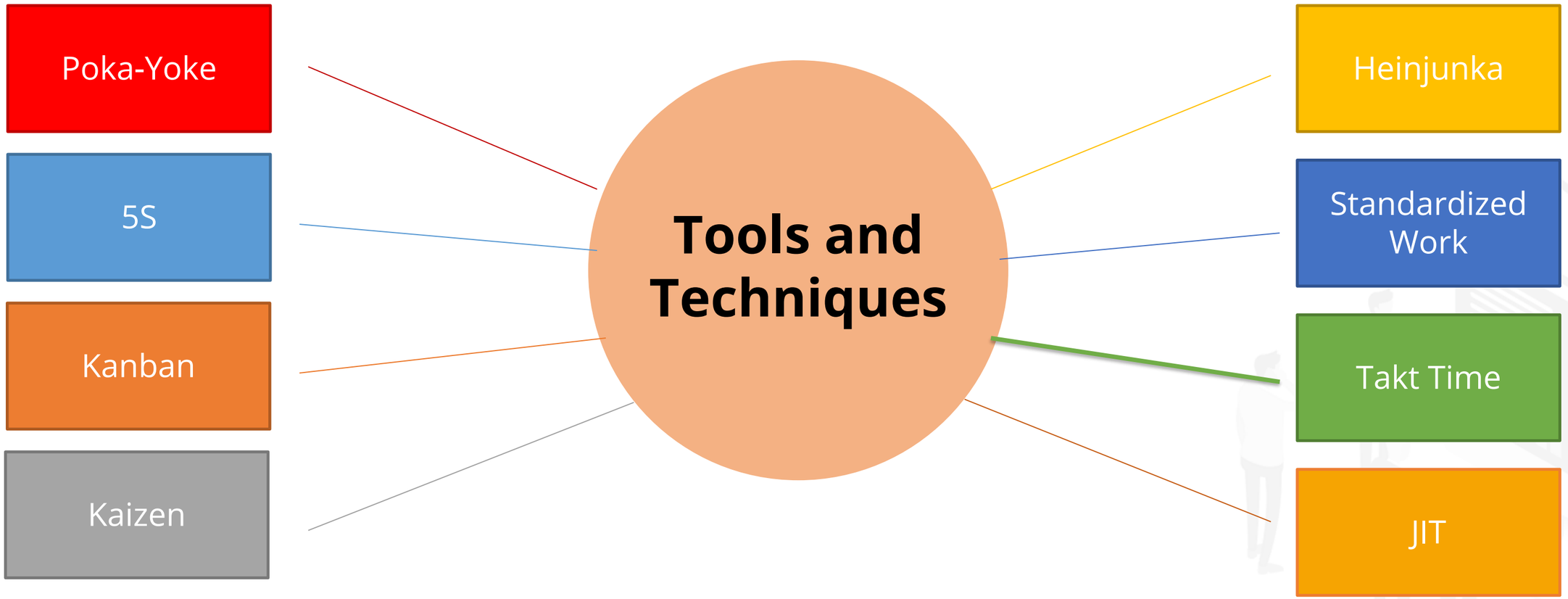
Doing more work than required by customer

- ✓ Handwork of polishing and deburring
- ✓ Unnecessarily tight tolerances

- ✓ Excessive quality review
- ✓ Duplicate entries

- ✓ Performing a surgery when a non-invasive procedure would work

Lean Tools and Techniques



Lean Tools and Techniques

- Poka-Yoke
- 5S
- Kanban
- Kaizen

Poka-Yoke or error proofing is used to design defect prevention into the production processes with the goal of achieving zero defects.

Example: A car that will not lock the doors, if it sense the car key is inside without the driver.

- Heinjunka
- Standardized Work
- Takt Time
- JIT

Lean Tools and Techniques

- Poka-Yoke
- 5S
- Kanban
- Kaizen

5S eliminates waste that results from a poorly organized work area.

Example: The organized approach to labors that ensure tools are in known location.

- Heinjunka
- Standardized Work
- Takt Time
- JIT

Lean Tools and Techniques

- Poka-Yoke
- 5S
- Kanban
- Kaizen

Kanban is a method used to regulate the flow of goods in order to eliminate waste from inventory and overproduction.

Example: Relying on signal cards to indicate when more materials to be ordered. This is used to replace physical inventories.

- Heinjunka
- Standardized Work
- Takt Time
- JIT

Lean Tools and Techniques

Poka-Yoke

5S

Kanban

Kaizen

Kaizen or continuous improvement refers to a culture where employees work together proactively to achieve consistent incremental improvements.

Example: Toyota has a Kaizen culture and this is desired in any Lean organization.

Heinjunka

Standardized Work

Takt Time

JIT

Lean Tools and Techniques

- Poka-Yoke
- 5S
- Kanban
- Kaizen

Heinjunka is a form of production scheduling that purposely manufactures in comparatively smaller batches. It reduces inventory and lead times of each product type or variant.

Example: Zara's ability to change and update clothing styles and provide to customers quickly

- Heinjunka
- Standardized Work
- Takt Time
- JIT

Lean Tools and Techniques

Poka-Yoke

5S

Kanban

Kaizen

Standardized Work documents the procedures' best practices

Example: Procedures and job aids

Heinjunka

Standardized Work

Takt Time

JIT

Lean Tools and Techniques

Poka-Yoke

5S

Kanban

Kaizen

Takt Time refers to the pace of production in which production with customer demands are well aligned.

Example: Knowing the frequency in which a product needs to be completed to meet the customers' demands and help pace production

Heinjunka

Standardized Work

Takt Time

JIT

Lean Tools and Techniques

Poka-Yoke

5S

Kanban

Kaizen

JIT is a philosophy. It produces necessary units in correct quantities and required quality at the right time. It relies on Lean tools like Kanban, Heinjunka, Standard Work, and Takt Time.

Example: Dell uses JIT principles to provide short lead times to customers

Heinjunka

Standardized Work

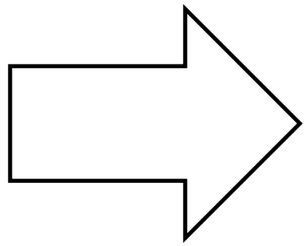
Takt Time

JIT

Theory of Constraints (TOC)

Theory of Constraints or TOC is a problem solving methodology for identifying the most important limiting factor, known as the constraint that stands in the way of achieving a goal and then systematically improving that constraint until it is no longer the limiting factor.

Identify constraint



Systematically improve constraint

Theory of Constraints (TOC)

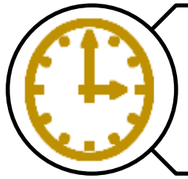
	Theory of Constraints	Lean Thinking
Goal	Increase profit by increasing throughput	Increase profit by adding value from customers' perspective
Measures	Throughput, inventory, and operating expense	Cost, lead time, and value-added percentage
What to Change?	Constraints	Eliminate waste and add value
How to Implement the Change?	Five-step, continuous process emphasizing acting locally	Five-step, continuous process emphasizing thinking globally

Theory of Constraints: Benefits

Increased profit

Fast improvement

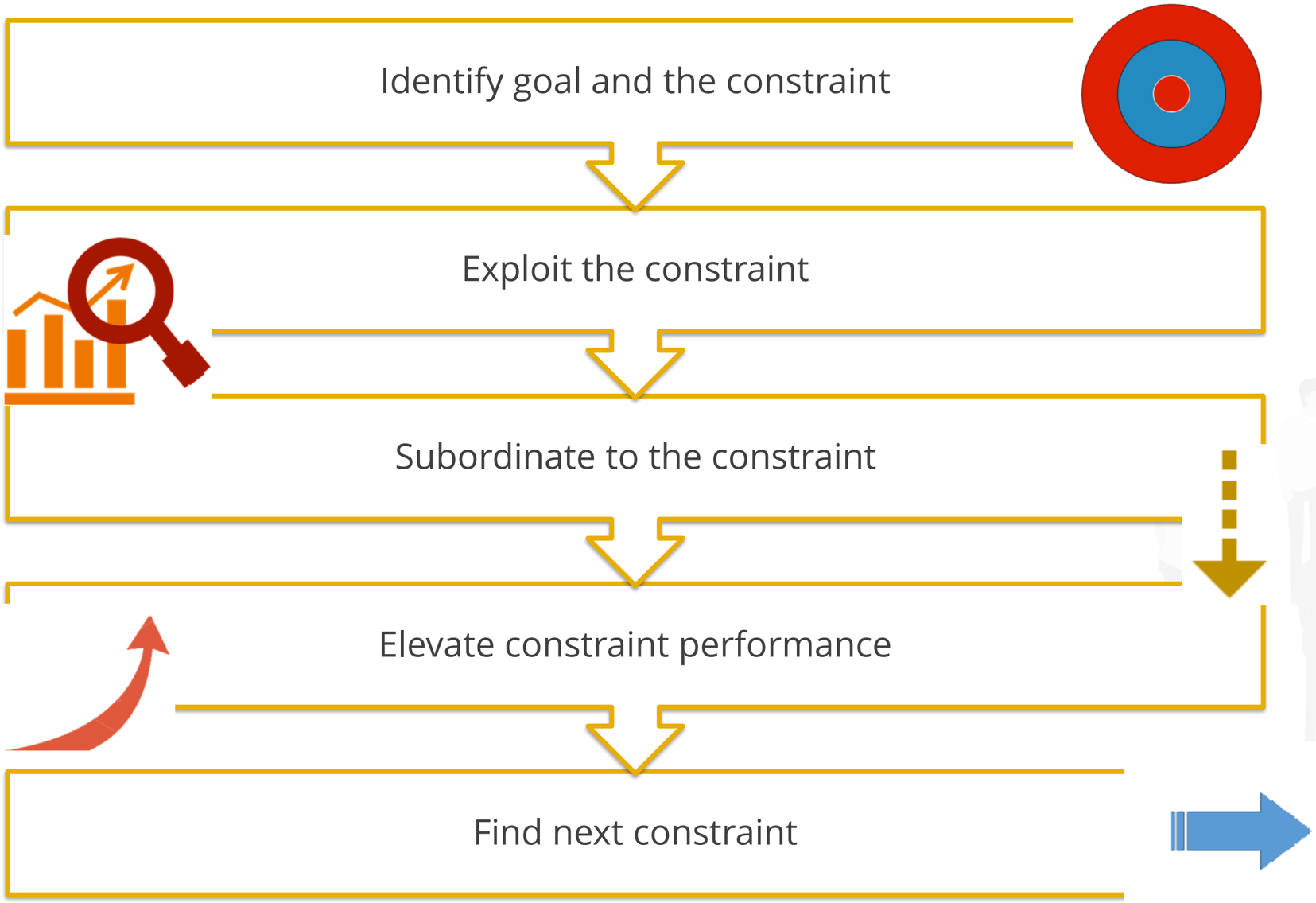
Improved capacity



Reduced lead times

Reduced inventory

Theory of Constraints: Five Steps



Example of TOC

Q

Kind Heart Hospital's emergency department is not able to keep up with daily demand. On average, the hospital receives 120 patients per day.

Department	Capacity to Process/Day
Registration	200
Triage	180
Medical team	90
Discharge	160

How can the Theory of Constraints methodology be used to improve this process?

Example of TOC

A

The constraint is the Treatment process

Bring in temporary workers

Keep process before and after the constraint running at steady pace

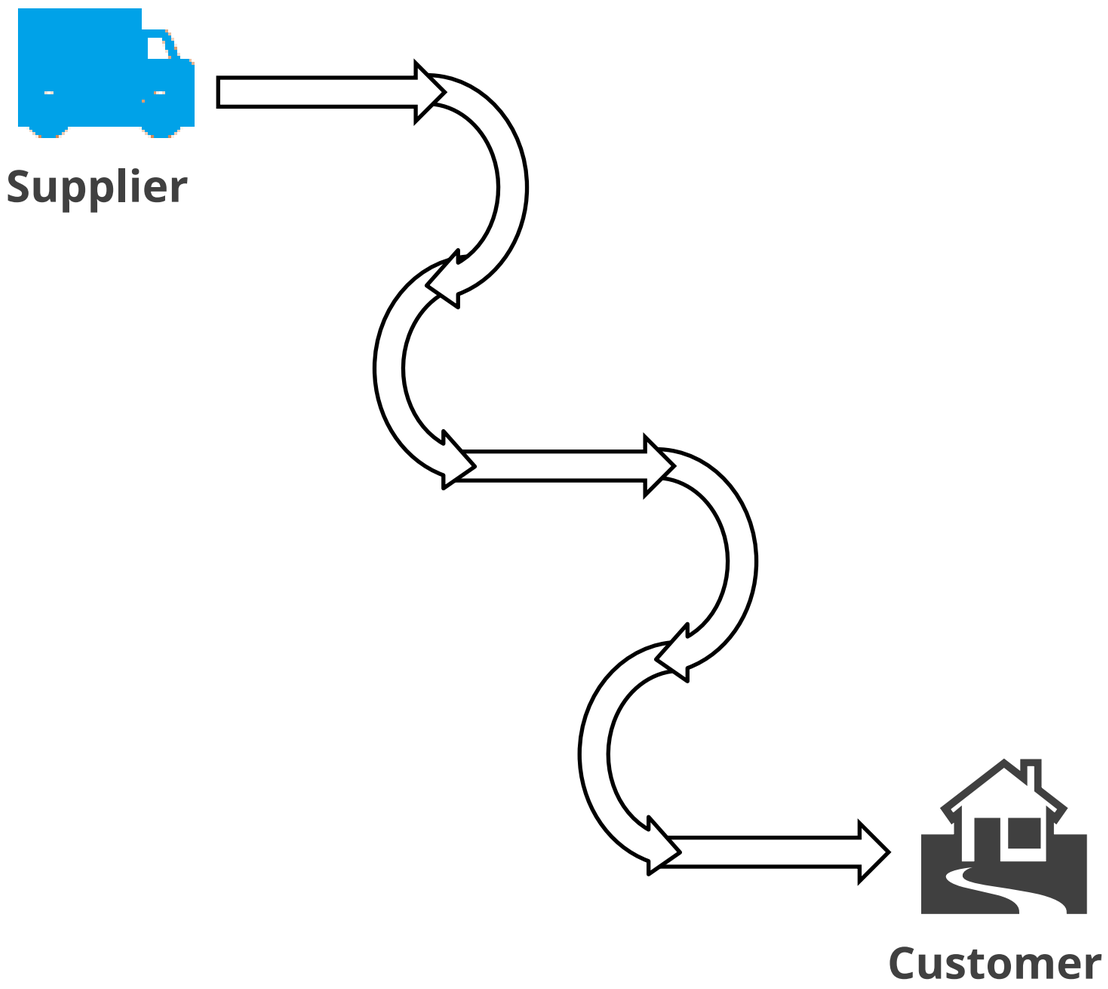
Implement solutions to improve Treatment process

Continue the cycle and look for the next constraint

DIGITAL OPERATIONS

Value Stream Mapping

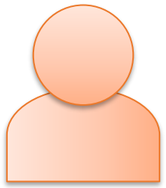
What Is a Value Stream Map?



- What does the current process look like?
- How does value flow through the process?
- What are the sources of the waste in the value stream?
- What areas of the process need the most improvement?
- What steps in the process add value and what steps do not add value?

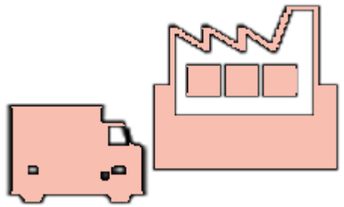
Types of Value Stream Maps

Value Added



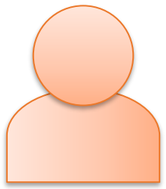
MAXIMIZE

Non-Value Added



ELIMINATE

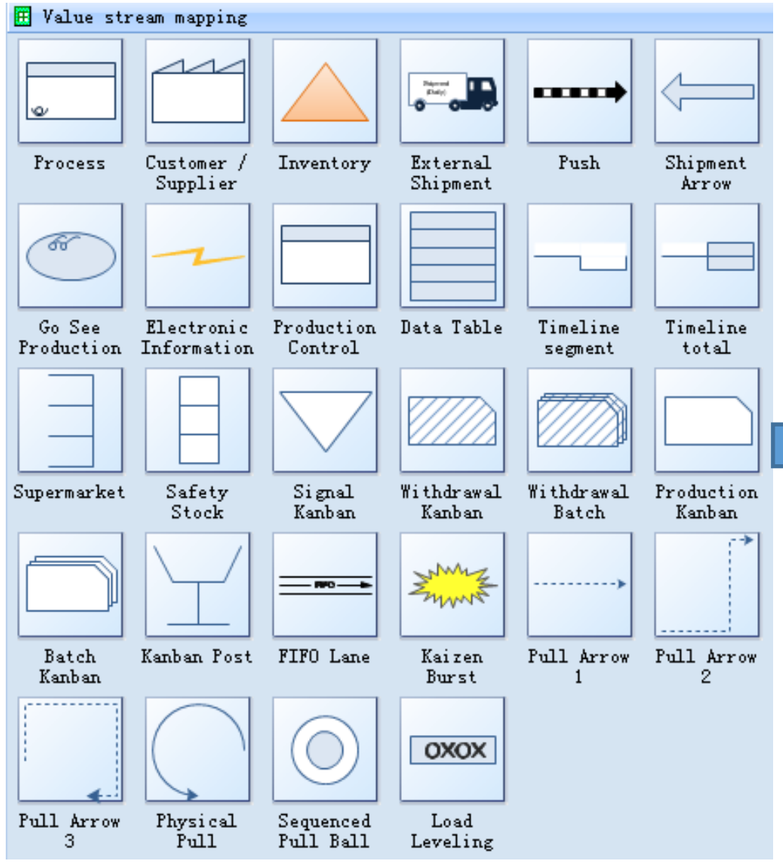
Required Non-value Added

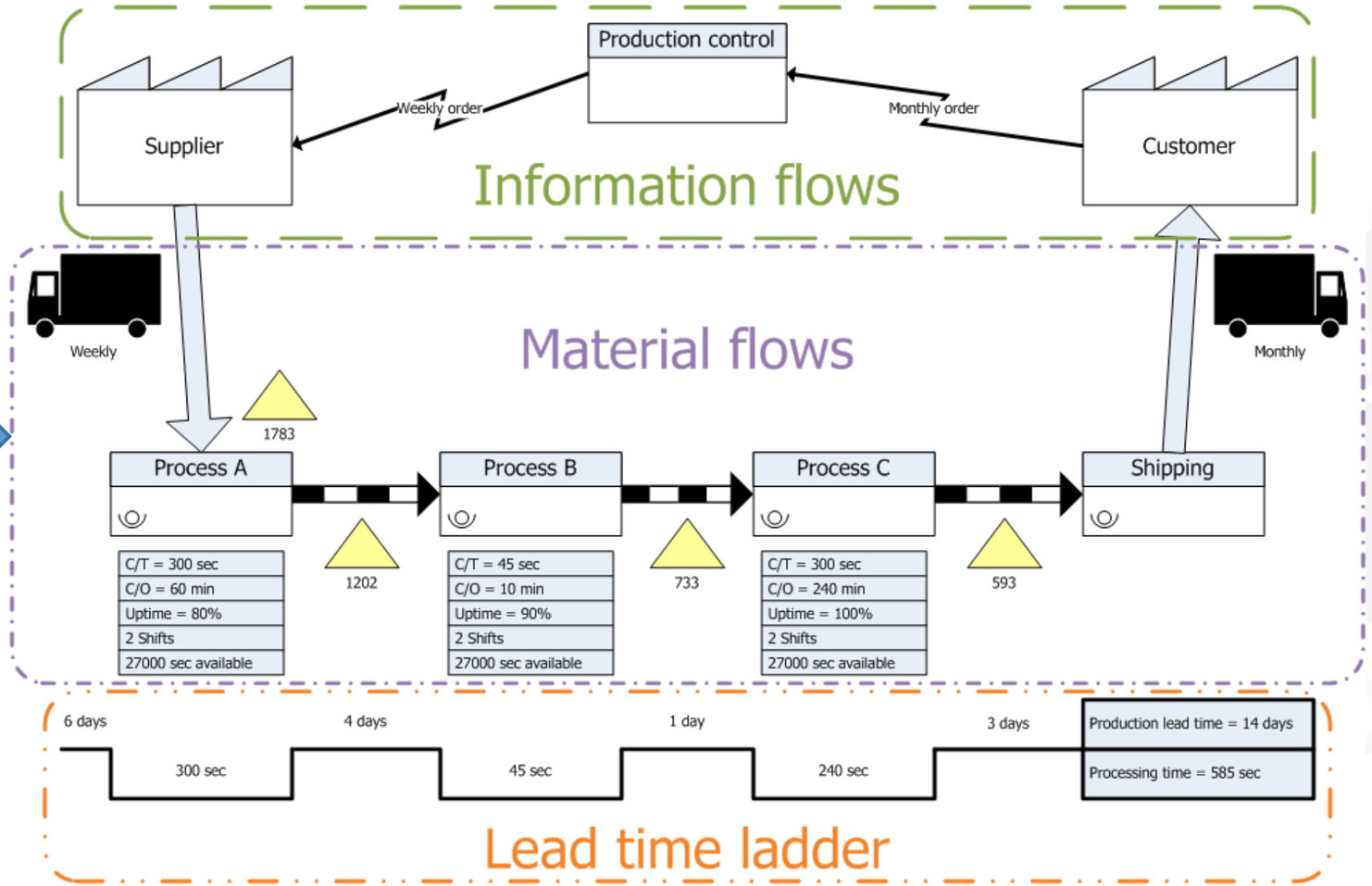


REDUCE

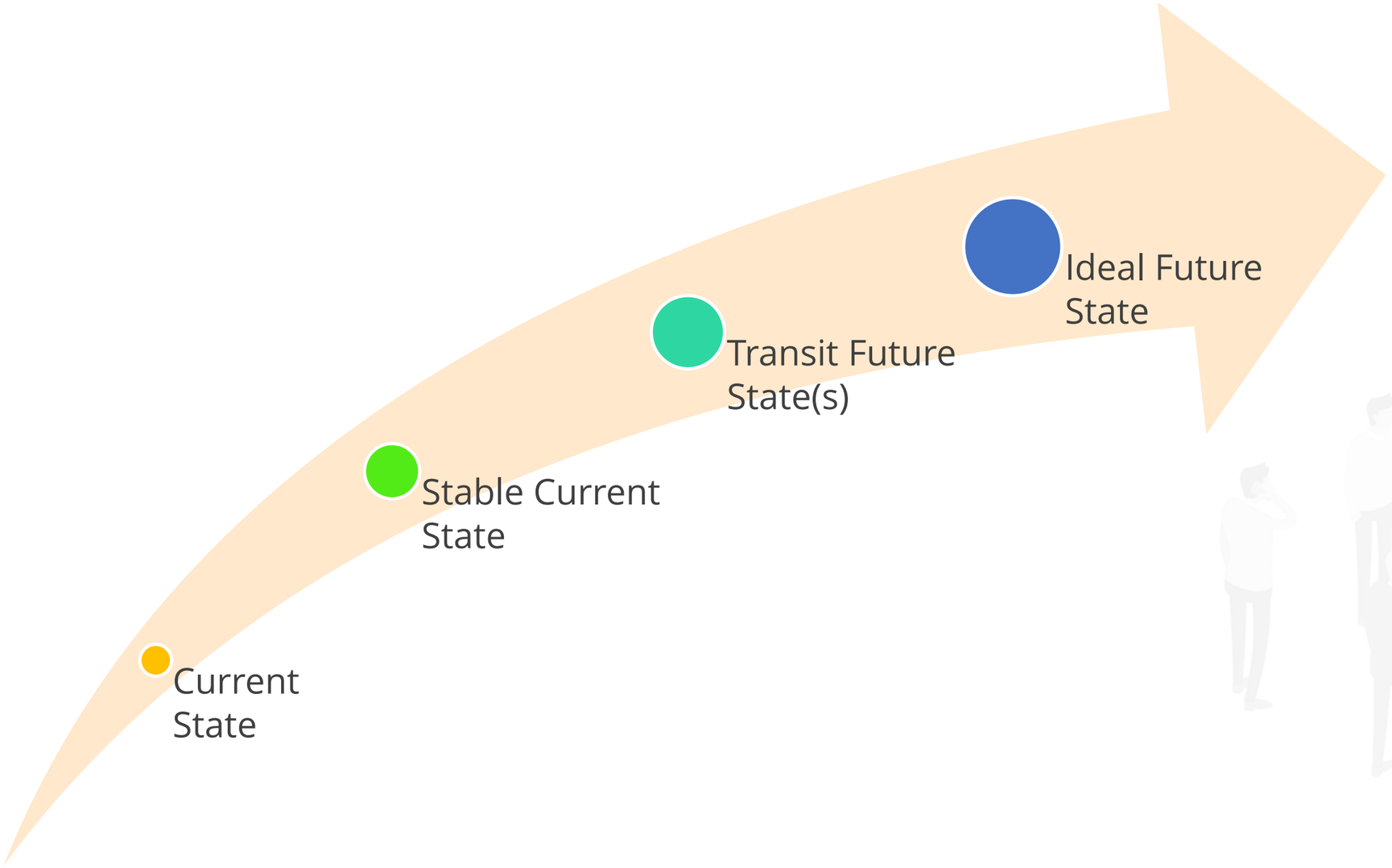
Value Stream Map Elements

Symbols and Processes





Value Stream Analysis

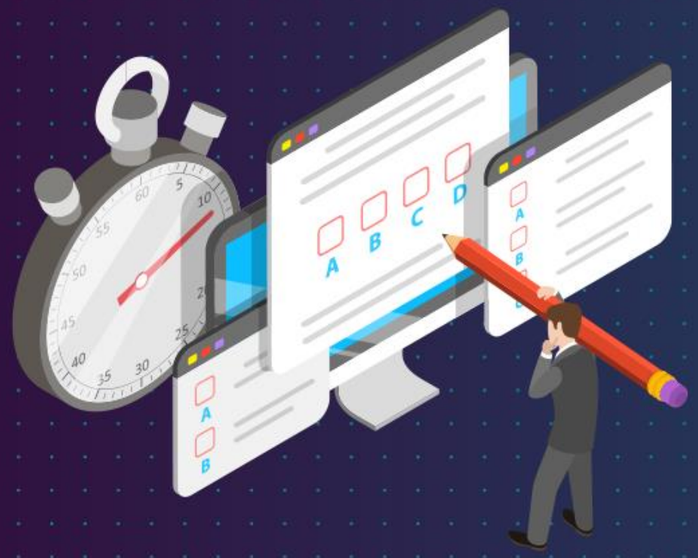


Key Takeaways

- Lean focuses on maximizing customer value while minimizing or even eliminating waste.
- Lean and Six Sigma are two different principles or methodologies that combine to form and create one powerful continuous improvement methodology.
- The common lean tools and techniques are Poka-Yoke, 5S, Kanban, Kaizen, JIT, Heinjunka, Standardized Work, and Takt Time.

Key Takeaways

- The Theory of Constraints is a methodology for identifying the most important limiting factor that stands in the way of achieving a goal and systematically improving it.
- Principles of Lean are to identify value, map the value stream, create flow, enable pull, and seek perfection.
- Value Stream Map is a visualization tool to map the flow and identify all activities involved in the value chain.



Knowledge Check

Knowledge Check

1

Which of the following statement is true?

A. Lean focuses on reducing variation and Six Sigma focuses on speed

B. Lean focuses on revenue and Six Sigma focuses on costs

C. Lean focuses on speed and Six Sigma focuses on reducing variation

D. There is no difference

Knowledge Check

1

Which of the following statement is true?

A. Lean focuses on reducing variation and Six Sigma focuses on speed

B. Lean focuses on revenue and Six Sigma focuses on costs

C. Lean focuses on speed and Six Sigma focuses on reducing variation

D. There is no difference

The correct answer is **C**

Lean is focused on elements that prevent products from reaching the customer quickly and Six Sigma is about ensuring consistency in products; however both have an strong emphasis of focusing on the customer.

Knowledge Check 2

In which Lean waste will you notice an operator sitting idle or working slowly while a machine cycles through various operations until the process is complete?

A. Inventory

B. Waiting

C. Over-processing

D. Excessive processing

Knowledge Check 2

In which Lean waste will you notice an operator sitting idle or working slowly while a machine cycles through various operations until the process is complete?

A. Inventory

B. Waiting

C. Over-processing

D. Excessive processing

The correct answer is **B**

In Waiting, the activities do not occur when they are supposed to.

Knowledge Check 3

A production team wants to make it easier and faster to find tools needed to perform tasks. Which Lean tool would they use?

A. 5S

B. Takt Time

C. JIT

D. Poka Yoke

Knowledge Check

3

A production team wants to make it easier and faster to find tools needed to perform tasks. Which Lean tool would they use?

A. 5S

B. Takt Time

C. JIT

D. Poka Yoke

The correct answer is **A**

5S is focused making sure the work area is clean and organized.

Knowledge Check

4

Which of the following is NOT a Lean waste?

A. Overproduction

B. Motion

C. Kanban

D. Inventory

Knowledge Check

4

Which of the following is NOT a Lean waste?

A. Overproduction

B. Motion

C. Kanban

D. Inventory

The correct answer is **C**

Kanban is not one of the Lean wastes

Knowledge Check

5

What is the major objective of the Theory of Constraints?

A. Improve profit by eliminating bottlenecks

B. Reduce variation in the process

C. Produce products more quickly

D. Impress customers by meeting demand

Knowledge Check

5

What is the major objective of the Theory of Constraints?

A. Improve profit by eliminating bottlenecks

B. Reduce variation in the process

C. Produce products more quickly

D. Impress customers by meeting demand

The correct answer is **A**

The Theory of Constraints or TOC is about identifying and eliminating what is limiting an organization from meetings its goal.

Knowledge Check

6

Which of the following value stream mapping activities generally include inspection and testing activities?

A. Value Added

B. Non Value Added

C. Required - Non Value Added

D. Enabling value added

Knowledge Check

6

Which of the following value stream mapping activities generally include inspection and testing activities?

A. Value Added

B. Non Value Added

C. Required - Non Value Added

D. Enabling value added

The correct answer is **C**

These activities do add value from the customer perspective but can be reduced or eliminated once the business has assurance of consistent product output

Knowledge Check 7

Which of the following tool or technique is used to prevent a mistake from occurring?

A. Kanban

B. Poke Yoke

C. JIT

D. 5S

Knowledge Check 7

Which of the following tool or technique is used to prevent a mistake from occurring?

A. Kanban

B. Poke Yoke

C. JIT

D. 5S

The correct answer is **B**

Poke Yoke is about preventing errors or mistakes from occurring.