Lean Thinking
Part I
Learning Objectives

At the end of this module, you will be able to:

• Describe the elements of a process
• Draw a process map
• Explain what constitutes value in a process
• List the five fundamental lean principles
• Describe several concepts and tools for implementing lean principles
What is a Process?

Set of actions which transform inputs to outputs

Process: A series of actions, changes, or functions bringing about a result

Identify the Customer

• What happens to the outputs of a process?

They go to a CUSTOMER!

• **External customers** - are outside an organization, money is typically exchanged with external customers
  • End users are customers who pay for an operational or consumable product or service

• **Internal customers** - are inside an organization, money is typically not exchanged directly with internal customers

• Customers also drive the inputs to a process through their needs and requirements
Process Maps

Only understood processes can be improved
Understanding a process is easier when it can be visualized
A process map is an organized visualization of all the interrelated activities which combine to form a process
Process Map For Fixing a Hot Dog

Customer

Deliver Order

Store

Cook Hot Dog

Put in bun
Add condiments

Clean up

Add to shopping list

Last Dog, bun?

Stop

Main process flow

Secondary, feeder flow

Information flow

Supplier, Warehouse

Task

Inventory, Wait

Decision
Team Exercise:  
Hot Dog Stand Process Map

- Develop a process map for S&A Hot Dogs  
  - Identify process input(s) and output(s)  
  - Make a rectangular post-it note for each process element  
  - Arrange on easel chart from input to output  
  - Add decision (diamond) and wait/inventory (triangle) post-its as needed  
  - Draw lines for process & information flow

- In 10 minutes, be prepared to explain your process map to the class
Basic Mapping Symbols

- Inventory or waiting
- Decision
- Task
- Issue!
- Burst
- Main process flow
- Secondary, feeder flow
- Information flow
A process map is a 2-D visualization of a process taking place in 3-D space and time.

Many ways to map even a simple process.

Goal is to capture and communicate the key features of the process.

Avoid unneeded details of each step.
Process Wrap Up

• Processes underlay everything we do

• Understanding and improving processes is the key to improving productivity

• The fundamentals of lean thinking are the foundation of modern process improvement
Five Lean Thinking Fundamentals

• Specify **value**: Value is defined by customer in terms of specific products and services

• 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

• Make value **flow** continuously: Having eliminated waste, make remaining value-creating steps “flow”

• Let customers **pull** value: Customer’s “pull” cascades all the way back to the lowest level supplier, enabling just-in-time production

• Pursue **perfection**: Pursue continuous process of improvement striving for perfection

Specify Value

<table>
<thead>
<tr>
<th>Value</th>
<th>Value Stream</th>
<th>Flow</th>
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**Value Added Activity**

- Transforms or shapes material or information or people
- And it’s done right the first time
- And the customer wants it

**Non-Value Added Activity – Necessary Waste**

- No value is created, but cannot be eliminated based on current technology, policy, or thinking
- Examples: project coordination, regulatory, company mandate, law

**Non-Value Added Activity - Pure Waste**

- Consumes resources, but creates no value in the eyes of the customer
- Examples: wait time, inventory, rework, excess checkoff, accidents
Can you see any mistakes?

Is inspection a value added, non value added necessary waste, or non value added pure waste activity?
Identify the **Value Stream**

A value stream is…

- ALL the linked end-to-end activities that take place to deliver value
- Starts with raw materials or initial information
- Ends with the end customer/user

**Customer needs/requirements, schedules**

**Value Stream**

- Value
- Flow
- Pull
- Perfection

**Product or service valued by the customer**

**Material or information or people**
What Moves In a Value Stream?

Value | Value Stream | Flow | Pull | Perfection

In manufacturing… material flows

In design & services… information flows

In human services… people flow
Analyzing the Value Stream

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<tbody>
<tr>
<td>Muda – Non value added</td>
<td></td>
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<tr>
<td>• Look for the eight wastes (next slide)</td>
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<tr>
<td>Muri – Overburden of people or equipment</td>
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<tr>
<td>• Results in safety and quality problems</td>
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<tr>
<td>Mura – Unevenness</td>
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<tr>
<td>• Irregular or fluctuating production or workload due to poor planning, staffing, inoperative equipment, missing supplies, or irregular demand.</td>
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<tr>
<td>Mura is a root cause</td>
<td></td>
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<tr>
<td>Muda is an outcome</td>
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Ref: J. Liker, *The Toyota Way*
### Seven Types of Waste

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<tr>
<td>1. Over-production</td>
<td>Creating more material or information or tests or treatment than needed</td>
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<tr>
<td>2. Inventory</td>
<td>More material or information than needed</td>
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<td>3. Transportation</td>
<td>Moving material or information or people</td>
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<td>4. Unnecessary movement</td>
<td>Moving employees to access or process material or information or patients</td>
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<tr>
<td>5. Waiting</td>
<td>Waiting for material, information or treatment - or work in process waiting to be processed.</td>
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<td>6. Defective outputs</td>
<td>Errors or mistakes causing the effort to be redone to correct the problem</td>
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<tr>
<td>7. Over-processing</td>
<td>Processing more than necessary to produce the desired output</td>
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<td>8. Unused employee creativity</td>
<td>Losing improvement opportunities by not engaging or listening to employees</td>
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Unnecessary Movement

Spaghetti charts are a powerful visual tool for seeing unnecessary movement.

Spaghetti Chart Example—BEFORE

Steps Triage Nurse takes to place patient in room

Total distance traveled = 1250 Feet=381m

Image by MIT OpenCourseWare.

Source: University of Michigan Health System, Ann Arbor, MI
## Kitting

Combining all relevant material, parts, and/or information into a single package which can be delivered to the Point-of-Use (POU) in a process to reduce unnecessary movement.

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- **Value Stream**: Combining all relevant material, parts, and/or information into a single package which can be delivered to the Point-of-Use (POU) in a process to reduce unnecessary movement.

- **Bill of Material**
- **Work Instructions**
- **Wire Bundle**
- **Tubes in a Shadow Box**

Courtesy of University of Michigan Health System, Ann Arbor, MI. Used with permission.
Mistake Proofing (poka yoke)

Mistake-proofing is the use of process or design features to prevent errors or the negative impact of errors.

Healthcare examples:
- Wristbands
- Self blunting syringes
- Automatic wheel chair brake

Others:
- “Left” and “right” side wires with different connectors
- Asymmetric mounting points
- Break-away gas nozzle with auto-shutoff

Checklists Reduce Defective Work

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### SURGICAL SAFETY CHECKLIST (FIRST EDITION)

**Before induction of anaesthesia**

- **SIGN IN**
  - Patient has confirmed:
    - Identity
    - Site
    - Procedure
    - Consent
  - Site marked/Not applicable
  - Anaesthesia safety check completed
  - Pulse oximeter on patient and functioning
  - Does patient have a:
    - Known allergy?
      - No
      - Yes
    - Difficult airway/aspiration risk?
      - No
      - Yes, and equipment/assistance available
    - Risk of >500ml blood loss
      - Yes, and adequate intravenous access and fluids planned

- **TIME OUT**
  - Confirm all team members have introduced themselves by name and role
  - Surgeon, anaesthesia professional and nurse verbally confirm:
    - Patient
    - Site
    - Procedure
  - Anticipated critical events
    - Surgeon reviews: what are the critical or unexpected steps, operative duration, anticipated blood loss?
    - Anaesthesia team reviews: are there any patient-specific concerns?
    - Nursing team reviews: has sterility (including indicator results) been confirmed? Are there equipment issues or any concerns?
    - Has antibiotic prophylaxis been given within the last 60 minutes?
      - Yes
      - Not applicable
    - Is essential imaging displayed?
      - Yes
      - Not applicable

- **SIGN OUT**
  - Nurse verbally confirms with the team:
    - The name of the procedure recorded
    - That instrument, sponge and needle counts are correct (or not applicable)
    - How the specimen is labelled (including patient name)
    - Whether there are any equipment problems to be addressed
    - Surgeon, anaesthesia professional and nurse review the key concerns for recovery and management of this patient

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Waste (Muda) Walk

- With your team, take 10 minutes to Identify with colored dots the
  - ● Value added process steps
  - ○ Necessary waste process steps
  - ● Pure waste process steps
- Use the 8 wastes as a guide
- Be ready to report your answers to the class, including your questions
Gemba* - the actual place

- Basic tenet of lean thinking – go to the place where work is being done and observe first hand the process in action
- Japanese call this *genchi genbutsu*, or go see for yourself
- Honda calls this the *three actuals*
  - Go to the actual place
  - Talk to the actual people
  - Doing the actual work
- Relying on data and observations produced by others does not give a complete understanding

* Sometimes the alternate transliteration *genba* is used.
16.660J / ESD.62J / 16.853 Introduction to Lean Six Sigma Methods
IAP 2012

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