Continuous Improvement Toolkit

Value Stream Mapping
- **Value Stream Mapping**

- A high-level visual representation of a business process.
- Helps to understand the flow of value as perceived by the customer.
- Helps identify and eliminate waste (Muda).
- Helps make the process as close to lean as possible.
- Considered as an improvement tool rather than just a definition of how the process operates or should operate.
- Value Stream Mapping

- It is often associated with **manufacturing**.
- It can also be applied in:
  - Product development.
  - Service related industries: e.g. healthcare, hospitality and logistics.
- **Value Stream Mapping**

- Used when you want to improve an end-to-end process in a single site.
- Value Stream Mapping

- Considered as:
  - A strategic tool.
  - A change management tool.
  - A communication tool.

- A collection of value and non-value added processes that produce a good, a service or a combination of both.
- Value Stream Mapping

- Helps identify opportunities for reducing waste and improving quality.
  - By making the non-value added activities more easy to identify.

- Effectively communicates where to focus the continuous improvement efforts to deliver more value.
- Value Stream Mapping

VSM is preferred over other process mapping techniques:

- When you want to find out the Lean opportunities that exist in your core processes.
- When you want to know the various inventories and delays exist in your processes.
- When you want to know the various business systems used by your processes.
- When you want to improve productivity, utilization and load distribution of staff.
- When you want to know the effectiveness of your customer service approach.
- When you want to present the health of your processes to the top management.
- Value Stream Mapping

Benefits:

- Gives the opportunity to understand what happens today.
- Helps discussing the needed improvements.
- Enables to see the big picture from beginning to end.
- Enables to see where problems lie within processes:
  - Non-value added activities.
  - Delays.
  - Rework.
  - Bottlenecks.
  - Excessive inventory levels.
  - Other forms of waste.
- Helps establishing a future state vision.
For example, the team may see an opportunity for maximizing the production rate to match the rate of customer demand.
- **Value Stream Mapping**

- A **value stream** is the set of all activities required to convert raw materials to a finished product in the hands of the customer.
- It includes other functions such as order-taking, order communication and detailed scheduling.

![Diagram of Value Stream Mapping]

- Manual/electronic information flow
- Material flow
- Value Stream Mapping

- In manufacturing, it spans from the event the materials are received until the finished products are delivered to the customer.

Typical VSM for Manufacturing
- Value Stream Mapping

Material Flow:

- It is where products flow through the stream.
- It includes:
  - Processing.
  - Handling.
  - Transport.
  - Storage.
- It can be separated into different branches that rejoin again.
- You don’t need to map the flow of every part or product but the production of a single product or product family.
- Focus on long lead time and high volume products.
**Value Stream Mapping**

**Material Flow:**

- A **Product Family Matrix** may be helpful.

<table>
<thead>
<tr>
<th>Products</th>
<th>Press</th>
<th>Shape</th>
<th>Bend</th>
<th>Paint</th>
<th>Assemble</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>B</td>
<td></td>
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<td>D</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
- Value Stream Mapping

Inventory:

- It is also important to look at the amount of raw materials, work in process (WIP), and finished products that are stored at any particular time.
- Value Stream Mapping

Information Flow:

- VSM represents the information flow along with the material flow.
- It is critical to the effective and timely execution of any process.

- It includes:
  - Orders, instructions, schedules, approvals and reports.
  - Replenishment cards.
  - Verbal discussions and communication.
- Value Stream Mapping

- There are two types of information:
  - **Manual** – information that is passed on manually or verbally.
  - **Electronic** – information that is passed on via telephone, fax, email, etc.

We should map informal processes as well.
- Value Stream Mapping

1. Select the Value Stream
2. Draw Current State Map
3. Draw Future State Map
4. Develop and Implement Improvements

Continuous Improvement Toolkit . www.citoolkit.com
- Value Stream Mapping

The Current State Map:

- Develops an understanding of how the value stream operates today.
- Helps identify the waste elements of the existing system.
- Value Stream Mapping

The Future State Map:

- The blueprint that you want to achieve toward a more lean business system.
- It should be based on Lean principles such as flow, pull and perfection to create a more streamlined production flow.
- Value Stream Mapping

Guidelines for Developing the Future State Map:

- Start only when the current state map is understood and agreed.
- Invite the people who are involved in the process.
- Look for steps in the process that can be simplified or eliminated.
- Value Stream Mapping

Guidelines for Developing the Future State Map:

- **Look for:**
  - Build-ups of inventory.
  - Stock shortages.
  - High scrap and rework rates.
  - Long travel distances.
  - Bottlenecks.
  - Significant variations in cycle times or demand levels.
  - Different time basis compared with key customers.
  - Lengthy checking or approval periods.
  - Too few or too many staff in key areas.
  - 5S and safety issues.
- Value Stream Mapping

Guidelines for Developing the Future State Map:

- Develop continuous flow wherever possible.
- Use **pull** and **kanban** systems and where continuous flow is not possible.
- Produce to **Takt time**.
- Send customer schedule to only one production process (the pacemaker process).
- Distribute the production of different products evenly.
- Value Stream Mapping

Implementation Plan:

- Should then be developed to get to the future state.
- Take into consideration the gaps between where we are and where we want to be.
- A timetable should be put together with milestones, review periods and responsibilities.
- Remember that this is a project that needs to be owned, tracked and monitored throughout its life cycle.
- Value Stream Mapping

VSM Symbols:

- Outside body
- Process
- Data box
- Manual/electronic information flow
- Material flow
- Transport

- No. of workers
- Business system
- Controlled inventory/safety stock
- FIFO sequence
- Inventory
- Signal Kanban

- Push
- Physical pull
- Kanban post
- Load leveling
- Go see
- Lightening burst

C/T = 1 sec
C/O = 1 hour
Uptime = 85%
NAT = 25200 sec

Max = FIFO

Inventory = 200
- Value Stream Mapping

Process Box:

- Used to indicate the process name.
- Covers one area of continuous flow:
  - Where products flow without being stored, queued or delayed.

<table>
<thead>
<tr>
<th>Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>C/T = 2.3 seconds</td>
</tr>
<tr>
<td>C/O = 52 minutes</td>
</tr>
<tr>
<td>Uptime = 85%</td>
</tr>
<tr>
<td>NAT = 25,200 seconds</td>
</tr>
<tr>
<td>Scrap rate = 3.1%</td>
</tr>
</tbody>
</table>
- Value Stream Mapping

Date Boxes:

- Used to carry all data related to a specific process box.
- Can also be used to display data and performance information related to:
  - Inventory
  - Transportation
  - Important suppliers
  - Important customers

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<th></th>
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<td>Scrap rate</td>
<td>3.1%</td>
</tr>
</tbody>
</table>
- Value Stream Mapping

Date Related to Suppliers may Include:

- Demand rate (items/day).
- Shipping frequency.
- Packaging size.
- Actual lead time.
- Required lead time.
- Error rate.
- Order adjustments.
- Supplier shift pattern.
- Number of suppliers.
- Different types of materials.

Supplier Name

| 5 Shipments/month
| 3 shifts, 24/7 operation
| Delivery time: 30-55 days |
- Value Stream Mapping

Date Related to Customers may Include:

- Customer demand (items/day).
- Shipping frequency.
- Packaging size requirement.
- Actual lead time.
- Required lead time.
- Error rate.
- Order adjustments.
- Customer shift pattern.
- Number of customers.
- Product mix.

**Customer Name**

- 300 items/day
- 87 type A, 120 type B
- Pallet = 30 items
- 3 shifts, 24/7 operation
- Value Stream Mapping

**Date Related to Each Process may Include:**

- Cycle time (CT).
- Changeover time (C/O).
- Net available working time (NAT).
- Production rate (i.e. units/day).
- Scrap rate / % defects.
- Machine uptime %.
- Processing time.
- Maximum capacity.
- Overall equipment effectiveness.
- Number of operators.
- Number of product variations.
- Value Stream Mapping

Transportation .. Inventory:
- Lot size.
- Transportation time.
- Number of product types.
- Distance traveled.
- Transportation frequency.
- .
- Amount of inventory.
- Queue or delay time.
- Number of product types.
- Inventory type.
- **Value Stream Mapping**

**How to Conduct a Value Stream Mapping Exercise:**

- Establish the team and include people working in the process, process owners and planners.
- Identify the product and the value stream.
- Physically walk the flow starting from the customer then work upstream through the process.
- Capture all relevant data and performance information as you walk.
- Always record what you see not what you are told is normally there.
- Walk the information flow and collect examples of relevant records.
- Value Stream Mapping

How to Conduct a Value Stream Mapping Exercise:

- Draw the map on a large piece of paper (consider zoning the map).
- Start with the material flow including processes, inventory, delays and transportation.
- Map the information flow and the secondary processes.
- Complete the data boxes.
- Add the VSM timeline and any other information you feel is relevant to the map.
- Identify the non-value added activities, delays, rework, bottlenecks, and other form of waste.
Zone the Map:

- Title and Date
- Information flow
  - External customers and suppliers
  - Secondary processes
- Material flow
  - Primary processes
  - Delays / inventory between processes
- Timeline
- VSM calculations
- Value Stream Mapping

How to Conduct a Value Stream Mapping Exercise:

- Brainstorm how to eliminate waste. Ask questions like:
  - Are things done in the right sequence?
  - Does information arrive on time?
  - Can any paper work be eliminated?
  - Are existing systems used in optimum way?
  - Is automation possible?
  - Is information available, reliable and up-to-date?
  - Is information really used in decision making?
  - Are there any quick wins possible?

- Visualize the ideal state and develop a future state map.

- Plan and implement actions to achieve the future state.
- Value Stream Mapping

Example: Start with customer requirements

- 15 trailers / day
  - Each 20 pallets
  - 3 shifts X 8 hrs
  - Each 20 pallets
- Value Stream Mapping

Example:

Draw material flow and add process data

<table>
<thead>
<tr>
<th>Process</th>
<th>Prod. Rate</th>
<th>P/T</th>
<th>C/O</th>
<th>Uptime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drawing</td>
<td>2450</td>
<td>30 sec</td>
<td>N/A</td>
<td>98%</td>
</tr>
<tr>
<td>Wall ironing</td>
<td>2800</td>
<td>17 sec</td>
<td>30 min</td>
<td>83%</td>
</tr>
<tr>
<td>Rinsing</td>
<td>2400</td>
<td>376 sec</td>
<td>60 min</td>
<td>94%</td>
</tr>
<tr>
<td>Painting</td>
<td>2200</td>
<td>179 sec</td>
<td>150 min</td>
<td>80%</td>
</tr>
<tr>
<td>Shaping</td>
<td>2400</td>
<td>45 sec</td>
<td>200 min</td>
<td>42%</td>
</tr>
<tr>
<td>Packaging</td>
<td>2450</td>
<td>397 sec</td>
<td>45 min</td>
<td>81%</td>
</tr>
</tbody>
</table>
**Value Stream Mapping**

**Example:**

<table>
<thead>
<tr>
<th>Process</th>
<th>Prod. Rate</th>
<th>P/T (sec)</th>
<th>C/O (min)</th>
<th>Uptime (%)</th>
</tr>
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<tr>
<td><strong>Draw</strong></td>
<td>2450</td>
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<td><strong>Pack</strong></td>
<td>2450</td>
<td>397</td>
<td>45</td>
<td>81%</td>
</tr>
</tbody>
</table>

**Steel company**
- 5 shipments / month
  - Each 20 containers
  - Each 2 coils

**Coil supplier**
- 5 shipments / month
  - Each 20 containers
  - Each 2 coils

**Customer**
- 3 shifts X 8 hrs
- 15 trailers / day
  - Each 20 pallets

- **FIFO**
- Add suppliers
Example:

- **Value Stream Mapping**

```
- **Weekly schedule** (Daily revised)

- **Value Stream Mapping**

  - **Drawing**
    - Prod. Rate = 2450
    - P/T = 30 sec
    - C/O = N/A
    - Uptime = 98%

  - **Wall ironing**
    - Prod. Rate = 2800
    - P/T = 17 sec
    - C/O = 30 min
    - Uptime = 83%

  - **Rinsing**
    - Prod. Rate = 2400
    - P/T = 376 sec
    - C/O = 60 min
    - Uptime = 94%

  - **Painting**
    - Prod. Rate = 2200
    - P/T = 179 sec
    - C/O = 150 min
    - Uptime = 80%

  - **Shaping**
    - Prod. Rate = 2400
    - P/T = 45 sec
    - C/O = 200 min
    - Uptime = 42%

  - **Packaging**
    - Prod. Rate = 2450
    - P/T = 397 sec
    - C/O = 45 min
    - Uptime = 81%

- **Customer**
  - 3 shifts X 8 hrs
  - 15 trailers / day - Each 20 pallets

- **Coil supplier**
  - 5 shipments / month
    - Each 20 containers
    - Each 2 coils

- **Process Flow**
  - Add information flow

- **Production control**
  - Quarterly forecast
  - Monthly order
  - Weekly order
  - Weekly ship schedule

- **Weekly forecast**
  - 3, 6 & 12 months
    - Demand forecast

- **Steel company**
  - 5 shipments / month
    - Each 20 containers
    - Each 2 coils

- **FIFO**
  - First in, first out
```
- Value Stream Mapping

Example:

Add timeline and VSM calculations

- **Drawing**
  - Prod. Rate: 2450
  - P/T: 30 sec
  - C/O: N/A
  - Uptime: 98%
  - 75 days
  - 30 sec

- **Wall ironing**
  - Prod. Rate: 2800
  - P/T: 17 sec
  - C/O: 30 min
  - Uptime: 83%
  - 0.1 days
  - 17 sec

- **Rinsing**
  - Prod. Rate: 2400
  - P/T: 376 sec
  - C/O: 60 min
  - Uptime: 94%
  - 0.4 days
  - 376 sec

- **Painting**
  - Prod. Rate: 2200
  - P/T: 179 sec
  - C/O: 150 min
  - Uptime: 80%
  - 0.2 days
  - 179 sec

- **Shaping**
  - Prod. Rate: 2400
  - P/T: 45 sec
  - C/O: 200 min
  - Uptime: 42%
  - 45 sec

- **Packaging**
  - Prod. Rate: 2450
  - P/T: 397 sec
  - C/O: 45 min
  - Uptime: 81%
  - 0.1 days
  - 397 seconds

**Coil supplier**
- 5 shipments / month
  - Each 20 containers
  - Each 2 coils

**Customer**
- 3 shifts X 8 hrs
- 15 trailers / day
  - Each 20 pallets

**Steel company**
**Coil supplier**
- 5 shipments / month
  - Each 20 containers
  - Each 2 coils

**Customer**
- 3 shifts X 8 hrs
- 15 trailers / day
  - Each 20 pallets
- Value Stream Mapping

Example:

Identify issues and opportunities

FIFO

<table>
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<tr>
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</tbody>
</table>

3, 6, & 12 months demand forecast

Weekly schedule (Daily revised)

Quarterly forecast

Monthly order

Weekly order

Customer

Coil supplier

Steel company

Coil supplier

5 shipments / month
- Each 20 containers
- Each 2 coils

Customer

15 trailers / day
- Each 20 pallets

FIFO

SMED

SMED

5S

5S

Wall ironing

Wowo ironing

Quality

Quality

Painting

Painting

Shaping

Shaping

Packaging

Packaging

Daily ship schedule

Semi-lean

Lean

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Non-Manufacturing Example – Equipment Installation:

- Forecasting
- Pick up parts
- Install equipment
- Functional test
- Fax request
- Notification
- Schedule installation

Customer service
Supplier
Customer
Further Information:

- It is important to define what is meant by the future before beginning to develop the future state.
- VSM tends to display more information than a typical process map.
  - A process map just shows the process as it is.
  - A value stream map highlights the flow of value and suggests improvements.
- Make sure that customer’s data is directly taken from the customer or from the person who receives customer orders.
- Value Stream Mapping

Further Information:

- It is sometime known as **material & information flow mapping**.
- A current state map without a future-state vision is waste.
- A future state map without an action plan to achieve it is waste.
- When the future state becomes a reality, it becomes the new current state.
- It is often useful to draw a series of future state maps starting with a blue sky vision and working backwards towards what is achievable in the shorter term.
Further Information:

- This icon is used to show where parts are transferred to the next process in sequence on a FIFO basis.

- Further useful VSM icons: