About Purdue MEP

**Who we are:** Purdue Manufacturing Extension Partnership (MEP)
- Division of Purdue Technical Assistance Program.
- Our staff consists of experts from a wide variety of business and manufacturing sectors.

**What we do:**
- We work exclusively with Indiana businesses, *primarily manufacturers*, to maximize performance through **streamlined processes, increased profitability, and increased competitiveness**.
- We offer public workshops, on-site training, and consulting services.
- Through these services Purdue MEP clients report **new sales, product and market growth, cost reductions, and job growth**.
Objectives

- Lean Thinking - Review
- Identify what waste looks like in transactional processes
- Learn the differences in value stream mapping (VSM)
- Discuss examples of VSM and improvement ideas
- Hands-on practice with value stream mapping of a transactional map
- Brief Intro to ABC’s of Sustainment
Lean Thinking

- **Fundamental Objective**: To create the most value while consuming the fewest resources.
- Define value from the customer’s perspective.
- Identify which process steps create value and which are only waste.
- Work to eliminate the root causes of the waste and allow for one-piece, continuous flow.

**These concepts apply to all organizations!**

**Application will be different!**
What Does Lean Mean?

- Costs
- Lead-time
- WIP
- Floor-space
- Flexibility
- Quality
- Employee satisfaction
Beyond Manufacturing?

- Administrative activities are often a major percentage of the total throughput time.
- Goal: 400% improvement in productivity over 10 years!!!!
- Modest opportunities on the plant floor; Untapped opportunities off the plant floor!!!!
- How do we document, measure, communicate, and, more importantly, realize these opportunities?
What’s Different?

- Many functions are not on the traditional “shop floor” value stream map
- Many functions support several value streams without clear boundaries
- Harder to identify customer, product and customer value
  - What do we track/map?
- Waste in administrative processes is much harder to see
  - more entrenched and hidden
Definition of Value-Added

Value-Added

- Any activity that increases the market form or function of the product or service.
  - These are things the customer is willing to pay for.

Non-Value-Added

- Any activity that does not add market form or function or is not necessary.
  - These activities should be eliminated, simplified, reduced, or integrated.
Lean = Eliminating Waste

Non-Value-Added

- Defects
- Overproduction
- Waiting
- Not Utilizing Employees K,S,A
- Transportation
- Inventory
- Motion
- Excess Processing
Identifying Transactional Waste

- Data Errors
- Design/Engineering Errors or Engineering Change Orders
- Filing/Scanning/Printing (Digital/Hard Copy)
Identifying Transactional Waste – Data Errors

Although companies understand the need for high quality data, 92% of organizations believe their customer and prospect data is inaccurate in some way. The level of inaccurate data is also climbing. The study revealed that 35% of US organizations believe that 32% of their data is inaccurate. This is up from 25% in one year’s time. - Larisa Bedgood: Director of Marketing for Relevate Auto
Identifying Transactional Waste – Data Errors

Most common data errors

<table>
<thead>
<tr>
<th>Issue</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incomplete or missing data</td>
<td>51%</td>
</tr>
<tr>
<td>Spelling mistakes</td>
<td>48%</td>
</tr>
<tr>
<td>Omitted information</td>
<td>32%</td>
</tr>
<tr>
<td>Duplicate data</td>
<td>22%</td>
</tr>
<tr>
<td>Traps</td>
<td>27%</td>
</tr>
<tr>
<td>Data entered in the incorrect field</td>
<td>2%</td>
</tr>
<tr>
<td>Inaccurate data</td>
<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
</tr>
</tbody>
</table>

Info from: Relevate Auto
Identifying Transactional Waste – Design/Engineering Errors

Many ECR’s can point to errors in the Engineering Process!
Identifying Transactional Waste – Design/Engineering Errors

Over Engineering/Robust Design

Approximate Relative Cost of Progressively Tighter Dimensional Tolerances

- Rough machining, +/- 0.030
- Standard machining, +/- 0.005
- Fine machining, +/- 0.001
- Very fine machining, +/- 0.0005
- Fine grinding, +/- 0.0002
- Very fine grinding, +/- 0.0001
- Lapping, polishing, +/- 0.00005

N.E. Woldman, Machinability and Machining of Metals

Surface Finish →

Procedure

1. Identify the types of waste present in the transactional process.
2. Categorize the waste into design/engineering errors.
3. Analyze the cost implications of each error type.
4. Implement corrective measures to reduce waste.

Conclusion

By identifying and addressing design/engineering errors, organizations can significantly reduce transactional waste and improve efficiency.

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Identifying Transactional Waste – Design/Engineering Errors

Not understanding specifications!!!
Identifying Transactional Waste – Filing/Scanning/Printing

Why do we print and then scan and then file???????
Identifying Transactional Waste – Overproduction/Inventory
Identifying Transactional Waste – Waiting

- Waiting for information or a process to be completed
- System downtime
- System response time
- Approvals from others
- Information from customers
Identifying Transactional Waste – Transportation

- Unnecessary routing
- Multiple hand-offs
- Multiple approvals
Exercise: Identifying Office Waste

- Break into groups of 4-5 people
- Select 3 of the wastes to discuss
- One example from each group
  - Times:
    - Waste Development: 5 minutes
    - Presentation: 1 minute each time
What Is a Value Stream?

- **Value stream**: All steps, both value added and non-value added, required to complete a product or service from beginning to end.

Manufacturing value stream:
- Mold
- Assemble
- Package
- Customer

Transactional (office) value stream:
- Review
- Approve / Reject
- Inform
- Customer
Types of Value Streams

There are many ways to do a value stream map.
What Is a Value Stream Map?

- A **value stream map (VSM)** is a visual depiction of the value stream.
  - Value stream mapping is a **lean manufacturing** technique.

Source: [https://www.slideshare.net/KyleBakken/460-operations-420](https://www.slideshare.net/KyleBakken/460-operations-420)
Lead Time, Capacity, Cost

- A value stream map links the 8 wastes to the metrics:
  - Lead time
  - Capacity
  - Cost

<table>
<thead>
<tr>
<th>Types of Waste</th>
<th>Value-Added</th>
<th>Non-Value-Added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overproduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waiting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Utilizing Employees (*K,S,A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess Processing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Knowledge, Skills, Ability
Value Stream maps can also be created using software. We call this value stream modeling.

This value stream map was created using the software eVSM (www.evsm.com). We’ll talk more about this later.
Clarifying the Terms

- **Value Stream**
  - The series of processes (primary and support) that create value directly for the external customer.

- **Support Processes**
  - These processes only create value for internal customers, but are currently necessary to run the business.
Types of VSMs

**Current state**
Shows the process as it is now.

**Ideal state**
Shows the process with all waste or non-valued added activities eliminated.

**Future state**
Shows the process as it realistically could be, with as much waste eliminated as possible.
Benefits of Value Stream Mapping

- Helps you visualize more than just a single process.
  - Allows you to see the flow and make decisions about it.
- Helps you see more than waste.
- Shows the linkage between materials flow and information flow.
- Can eliminate the possible need for capital expenditures.
- Opens capacity for growth.
- Forms the basis of an implementation plan.

Foundations of VSM

  - The mapping you will do today is based on this book.

Source: https://www.amazon.com/Learning-See-Stream-Mapping-Eliminate/dp/0966784308
VSM Process

1. Select the value stream to be improved
2. Map the current state
3. Design the future state
4. Create an implementation plan
5. Implement and evaluate

Start here
Customer Block

Customer Name or Product

How many (Max or Avg)

Unit that is used

Customer Incoming Demand

Customer Demand: 100.0 Unit/Wk
Inventory/Waiting Block

- **Number of units**
- **Normal wait time in inventory**
- **Blue is Auto Field**

<table>
<thead>
<tr>
<th></th>
<th>Wait</th>
<th>Demand</th>
<th>Repeat Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qty</td>
<td>2.00</td>
<td>20.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Units</td>
<td>Wk</td>
<td>Unit</td>
<td>Unit</td>
</tr>
</tbody>
</table>

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Split Block

Means that paperwork goes to multiple places

Blue is Auto Field

Demand 20.0 Unit Day
Repeat Demand 6.0 Unit Day
Join Block

Means that paperwork comes back together.

Blue is Auto Field
Decision Block

What is the decision being made?

Blue is Auto Field

<table>
<thead>
<tr>
<th></th>
<th>Demand</th>
<th>Repeat Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Day</td>
<td>20.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>
Termination Block

Process terminates at this point.

Blue is Auto Field
### Activity Block

<table>
<thead>
<tr>
<th>Name of activity</th>
<th>Function within org performing activity</th>
<th>Time to complete process per unit</th>
<th>How long before it moves to next step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Contract</td>
<td>Information Systems</td>
<td>PT: 60.00 Min</td>
<td>0 Day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LT: 1.0 Wk</td>
<td>0 Day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Demand: 20.0 Unit/Day</td>
<td>Repeat PT: 45.0 Min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Repeat Demand: 6.0 Unit/Day</td>
<td>Repeat LT: 3.0 Day</td>
</tr>
</tbody>
</table>

Blue is Auto Field

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### Activity Block

#### Create Contract

<table>
<thead>
<tr>
<th>Functions</th>
<th>Information Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT</td>
<td>60.00 Min</td>
</tr>
<tr>
<td>LT</td>
<td>1.0 Wk</td>
</tr>
<tr>
<td>Demand</td>
<td>20.0 Unit/Day</td>
</tr>
<tr>
<td>Repeat Demand</td>
<td>6.0 Unit/Day</td>
</tr>
<tr>
<td>Repeat PT</td>
<td>45.00 Min</td>
</tr>
<tr>
<td>Repeat LT</td>
<td>3.00 Day</td>
</tr>
</tbody>
</table>

**If repeated how long before it is moved back to the next step**

**If we have a repeat, how long does the process take**
Case Study – 10 Min (3 per Team)

ACME Proposals Fulfillment Process - Overview

The leadership at ACME Industries has become increasingly concerned about the time taken to respond to customers’ RFQ’s (Request for quotation) with proposals. They have received customer complaints about the long length of time quoted for response and additionally about proposals that are not then received by the quoted times. They have tasked a team to investigate and make recommendations towards improving the process, increasing customer satisfaction, and closing more sales.
ACME Case Study

Customer
100 RFQ's / Wk
Qty= 80
Wait= 2 Wk

Sales
Process Time: 10 Min
Lead Time: 1 Wk
Repeat Process Time: 5 Min
Repeat Lead Time: 1 Day
Qty=50
Wait=1 Wk

Legal
Process Time: 1 Hr
Lead Time: 1 Wk
Repeat Process Time: 45 Min
Repeat Lead Time: 3 Days
Qty= 200
Wait= 2 Wk

Engineering
Process Time: 45 Min
Lead Time: 1 Wk
Repeat Process Time: 30 Min
Repeat Lead Time: 2 Days

Management
150 RFQ's / Day
Meeting: Once a week

ACME Data
5 Days / Wk
8 Hrs / Day

0% 30% 60% 90% 100%
Max 1 Time

ACME Case Study
Instructions

1. Add the data collected to the value stream map (put the data in the highlighted fields).
2. Estimate process times as a percentage of lead times.
## Summary Results

<table>
<thead>
<tr>
<th>Route</th>
<th>Route Name</th>
<th>Route Traversals</th>
<th>Route %</th>
<th>Cumulative Route %</th>
<th>Lead Time (longest)</th>
<th>Total Wait</th>
<th>Total PT</th>
<th>PT Percent</th>
<th>Period Cost</th>
<th>Cumulative Cost %</th>
<th>Termination Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prep</td>
<td>Check</td>
<td>Approve</td>
<td>11.76</td>
<td>58.80</td>
<td>58.80</td>
<td>35.00</td>
<td>360.00</td>
<td>9.92</td>
<td>2.75</td>
<td>845.25</td>
</tr>
<tr>
<td>2</td>
<td>Prep</td>
<td>Check</td>
<td>Prep</td>
<td>Check</td>
<td>Approve</td>
<td>5.20</td>
<td>26.00</td>
<td>84.80</td>
<td>64.00</td>
<td>648.00</td>
<td>19.25</td>
</tr>
<tr>
<td>3</td>
<td>Prep</td>
<td>Check</td>
<td>Deny</td>
<td>2.16</td>
<td>10.80</td>
<td>95.60</td>
<td>35.00</td>
<td>360.00</td>
<td>9.92</td>
<td>2.75</td>
<td>155.25</td>
</tr>
<tr>
<td>4</td>
<td>Prep</td>
<td>Check</td>
<td>Prep</td>
<td>Check</td>
<td>Deny</td>
<td>0.88</td>
<td>4.40</td>
<td>100.00</td>
<td>64.00</td>
<td>648.00</td>
<td>19.25</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td></td>
<td></td>
<td>20.00</td>
<td>100.00</td>
<td>100.00</td>
<td>43.82</td>
<td>447.55</td>
<td>12.75</td>
<td>2.82</td>
<td>1741.50</td>
<td>100.00</td>
</tr>
</tbody>
</table>
ABC’s of Sustainment

**Antecedent:** Any stimulus that precedes a behaviour; something that the child can hear, feel, see, taste or smell

**Behaviour:** The response that the child displays; anything the child says or does after the antecedent;

**Consequence:** Stimulus that occurs after the behaviour; Anything that the child will or won't receive following the child's behaviour, praise, attention, a sticker, a lolly

Credit for Concepts: Aubrey Daniels, “Bringing out the best in people”
ABC’s of Sustainment

Antecedent  Behavior  Consequence

Complete Learning Trial
Review Learning Objectives

- Lean Thinking - Review
- Identify what waste looks like in transactional processes
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