Learning Objectives

- The difference between a value stream map and a metrics-based process map.
- Key time and quality metrics for office, service, and knowledge work processes.
- The step-by-step approach for creating current and future state MBPMs.
- How to use the results obtained through this methodology to monitor processes and drive ongoing improvement.
Traditional Mapping Method: Process Flow Chart

Where's the quality? Where's the time?

What is a Metrics-Based Process Map?

- A visual process analysis tool, which integrates:
  - Functional orientation of traditional swim lane process maps
  - Key Lean time and quality metrics
- Tool which highlights the disconnects / wastes / delays in a process
  - Keeps the improvement focus properly directed
- Serves as standard work for workforce training and process monitoring
When Do We MBPM?

- **Value Stream Driven**
  - **VSM** is the *strategic* tool that identifies *when* we need to perform a more detailed analysis of a process.
  - **MBPM** is a *tactical* tool used to flesh out the details at each step to see the “waste behind the waste”
    - Enables a team to “drill down” from a few targeted blocks on the VSM
    - Often the first activity in an office-based Kaizen Event
Identify Critical Path & Create the Timeline
MBPM Post-it Conventions

- **Activity** (Verb / Noun)
- **# Staff** (if relevant)
- **% Complete & Accurate**
- **Step #**
- **Function that performs the task**
- **Barriers to flow** (if relevant)
- **PT (process time)**
- **LT (Lead time)**

Task-Level Metrics: Time

- **Process time (PT)**
  - The time it takes to actually perform the work, if one is able to work on it uninterrupted
  - Includes task-specific doing, talking, and thinking
  - aka “touch time,” work time, cycle time

- **Lead time (LT)**
  - The elapsed time from the time work is made available until it’s completed and passed on to the next person or department in the chain
  - aka throughput time, turnaround time, elapsed time
Key Lean Metric: Quality

- **%Complete and Accurate (%C&A)**
  - % time downstream customer can perform task without having to “CAC” the incoming work:
    - Correct information or material that was supplied
    - Add information that should have been supplied
    - Clarify information that should or could have been clear
  - This output metric is measured by the immediate downstream customer and all subsequent downstream customers.

Creating the Current State MBPM Phase I

1. Label the map in upper right corner.
   - Process name, date, facilitator and/or team members
2. List the functions involved in left column.
3. Document all activities/steps.
   - Verb/noun; concise language; include function as well.
4. Number the activities.
   - One number per column; concurrent activities are labeled A, B, C, etc.
5. Add activity-specific metrics (PT, LT, %C&A), barriers to flow, and number of staff involved (if relevant).
   - Include units of measure (mins, hrs, days, etc.)
Step 2: Create swim lanes for each functional area

Step 3: Document each activity and handoff(s)
Step 4: Number the activities
Step 4: Add key metrics (PT, LT, %C&A) and barriers to flow
Typically obtained via interview

Who determines?
- Immediate downstream customer
- All subsequent downstream customers who use a party’s output in any way

Where placed?
- On the post-it for the person producing the output

0% at a particular step is not rare

6. Define the critical path.
   - Longest LT unless “dead-end” step; use colored marker
7. Create the timeline.
8. Calculate the summary metrics
   - CP PT Sum, CP LT Sum, AR, RFPY, Total PT, Labor Required
9. Identify the value-adding and necessary non-value-adding activities
   - Use small colored post-it labeled with “VA” and “N.”
10. Circle the step-specific metrics that indicate the greatest opportunity for improvement.
    - Use red marker.
    - Longest LTs, Low %C&As, High PTs, Low step-specific ARs
Step 6: Define the Timeline Critical Path

With parallel activities: Choose the longest LT unless a “dead-end” activity

Step 7: Create the Timeline
Step 8: Calculate Summary Metrics - Time

- Critical Path PT Sum (CP PT)
- Critical Path LT Sum (CP LT)
- Activity Ratio (AR)
  - The percentage of time work is being done to the patient/item/data passing through the process
  - \[ AR = \left( \frac{CP\ PT\ Sum}{CP\ LT\ Sum} \right) \times 100 \]
  - Expressed as a percentage
  - \[ 100 - AR = \%\ of\ time\ product\ is\ idle \]

Step 8 (continued): Calculate Summary Metrics - Quality

- Rolled First Pass Yield (RFPY) =
  - Product of all %C&A's
  - The percentage of “items” (material, information, or people) that pass through the entire process with no rework required
  - Process check: The RFPY will always be lower than the lowest &C&A.
Step 8 (continued): Calculate Summary Metrics - Labor Requirements

\[
\text{# FTES}^* = \frac{\text{Total PT}^{**} \text{ (in hrs)} \times \# \text{ occurrences/year}}{\text{Available work hrs/year/employee}}
\]

Freed Capacity = CS FTEs - FS FTEs

* FTE = Full-time Equivalent (2 half time employees = 1 FTE)

** Total PT = Sum of all activities' PTs, not just critical path

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Step 8 (continued): Document Results

<table>
<thead>
<tr>
<th>Metric</th>
<th>Current State</th>
<th>Projected Future State</th>
<th>Projected % Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP PT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CP LT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFPY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total PT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor requirements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freed capacity</td>
<td>_________</td>
<td></td>
<td>_________</td>
</tr>
</tbody>
</table>
Step 9: Label the value-adding (VA) and necessary non-value adding (N) activities

Step 10: Circle the data that indicates the greatest need for improvement
Islands of value-adding activities
All other time is “waste.”

Future State Design: How can we progress from one “VA” or “N” step to the next and eliminate all waste?

Goals
- Reduce overall LT
- Improve RFPY
- Reduce overall PT
- Improve LT, PT, and %C&A at individual steps

How?
- Eliminate NVA steps
- Minimize handoffs
- Eliminate rework
- Reduce batching
- Eliminate unnecessary IT
- Reduce WIP
Root Cause Analysis
4 Key Tools

5 Why's
Why?
Why?
Why?
Why?
Why?

Check Sheets Quantify Occurrences

<table>
<thead>
<tr>
<th>Reason</th>
<th>Tally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine failure</td>
<td></td>
</tr>
<tr>
<td>Quality issue requiring review</td>
<td></td>
</tr>
<tr>
<td>Escalation of purchasing</td>
<td></td>
</tr>
<tr>
<td>Order entry error</td>
<td></td>
</tr>
<tr>
<td>Changing customer requirements or no adjustment to expected delivery</td>
<td></td>
</tr>
<tr>
<td>Newspaper / Internet</td>
<td></td>
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</tbody>
</table>

Pareto Chart
Credit Application Delays

<table>
<thead>
<tr>
<th>Reason for Delay</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Signature</td>
<td>2909</td>
</tr>
<tr>
<td>Insufficient Bank Info</td>
<td>627561</td>
</tr>
<tr>
<td>No prior address</td>
<td>242180</td>
</tr>
<tr>
<td>Current Customer</td>
<td>2493</td>
</tr>
<tr>
<td>No Credit History</td>
<td>41%</td>
</tr>
<tr>
<td>Other Reason</td>
<td>77%</td>
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</table>

PACE Prioritization Matrix

<table>
<thead>
<tr>
<th>Anticipated Benefit</th>
<th>Ease of Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Easy</td>
</tr>
<tr>
<td></td>
<td>Priority</td>
</tr>
<tr>
<td></td>
<td>Action</td>
</tr>
<tr>
<td></td>
<td>Consider</td>
</tr>
<tr>
<td></td>
<td>Eliminate</td>
</tr>
</tbody>
</table>

High          Low
Anticipated Benefit

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<td>AR</td>
<td></td>
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</tr>
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</tr>
<tr>
<td>Freed capacity</td>
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</table>

Electronic Documentation?

- Archive the team’s work
- Distribute the maps to remote locations
- Document the new standard work for the process
  - Training/retraining staff
  - Monitoring process performance
- Communicate the impact of Kaizen Events and other improvement activities
Excel-Based Option

Custom toolbar with pull-down menus

Seven sheets
- Current State
- Future State
- Summary Metrics
- Audit Findings
- Metrics Descriptions
- Sample MBPM
- Quick Start Guide

<table>
<thead>
<tr>
<th>Functions</th>
<th>Process Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
<td>Fax PO to Sales Rep</td>
</tr>
<tr>
<td>Sales Rep</td>
<td>Customer PO goes to warehouse</td>
</tr>
<tr>
<td>Finance</td>
<td>xyz</td>
</tr>
<tr>
<td>Warehouse / Shipping</td>
<td>yz</td>
</tr>
</tbody>
</table>

Blue color-coded cells indicate the critical path

Mary Townsend
Hours Worked per Day
Sally Dampier
Occurrences per Year
Sam Parks

### The Critical Path: Blue Color-Coding

Critical path metrics auto-populate timeline

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**Critical Path**

1. **Sales Step**
   - Activity: Approve FG
   - Duration: 5
   - Color: Blue

2. **Accounts Manager**
   - Activity: Validate C#
   - Duration: 5
   - Color: Blue

3. **Order Carry**
   - Activity: Order Entry
   - Duration: 2
   - Color: Blue

4. **Finance**
   - Activity: Receive Check
   - Duration: 1
   - Color: Blue

---

**Summary Metrics**

- **Critical Path FT Sales**
  - Current State: 143
  - Projected State: 42
- **Critical Path FT Sales**
  - Current State: 213
  - Projected State: 14
- **R&D Team**
  - Current State: 8.8
  - Projected State: 8.8
- **Available Work Hours per Year**
  - Current State: 104
  - Projected State: 104

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**Auto-Calculates:**
- Summary time and quality metrics for before and after maps
- Projected % improvement (color-coded for visual ease)
- Staffing requirements
- User-defined metrics
**MBPM Tips**

- 10 people max per team; use same people for both current and future state
- Documenting the current state takes 1/3 to double the time of the future state design phase
- Avoid gaps between current and future state mapping
- Typical teams need 5-10 blocks to truly understand what you’re asking in terms of the metrics
- Can “chunk” metrics if needed
- Use a skilled, impartial facilitator

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MBPM Resources

Additional Questions?

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