

Accelerate Project Delivery Guidebook

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Welcome

Welcome to Accelerate Project Delivery, a comprehensive online guidebook developed to support MEP center field staff responsible for delivering the Accelerate project. Local MEP centers should use this material when training and directing field staff in the delivery of Accelerate projects.

Accelerate Project Goals and Activities

General Principles

The following are the general principles for local MEP deployment of Accelerate projects:

- **MEP works confidentially for the Supplier.**

The MEP will not share Supplier information with the OEM or other Suppliers. The Supplier shares its own project information with the OEM.

- **MEP functions as an honest 3rd party broker of supply chain improvement services.**

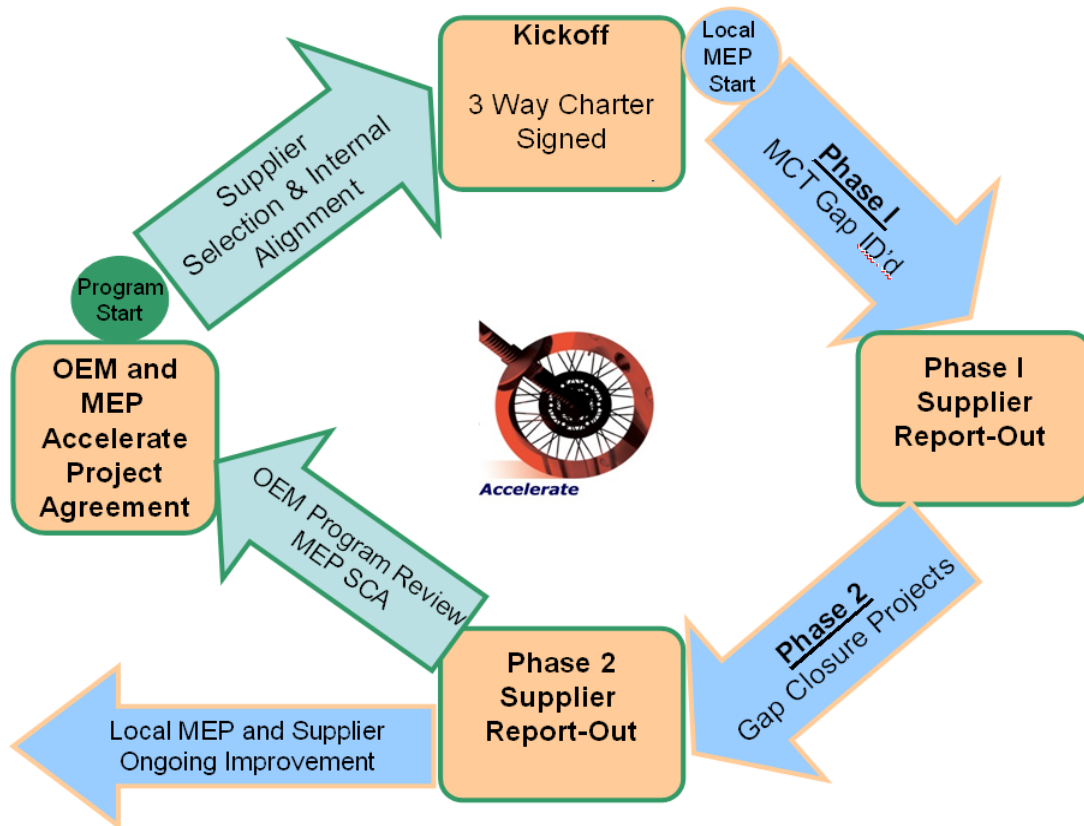
Although the MEP facilitates the identification of improvement opportunities, the Supplier owns decision-making regarding improvements. MEP will not function as an arm of the OEM or get involved in pricing or resourcing discussions.

- **Local MEP builds Supplier internal competency in use of improvement methodologies.**

Accelerate Phase I projects trains the Supplier with internal competency for Value Stream Mapping and MCT (Manufacturing Critical-path Time) calculation.

- **Local MEP owns the ongoing Supplier relationship and endeavors to assist the client in an enterprise-wide systematic continuous improvement transformation.**

The MEP brings a total business transformation approach into every Accelerate project. Accelerate introduces Suppliers to the resources of their local MEP and the MEP to Supplier business needs for ongoing improvements independent of OEM involvement.



Note: A detailed guide to the Accelerate process is available in the document titled "*Accelerate Guidebook: Instructions for Original Equipment Manufacturers and Suppliers.*" You can download a copy of this document from the [WMEP Web site](#).

The engagement of the local MEP (depicted in the blue arrows in the diagram above) begins after the Accelerate program Kickoff meeting to manage the client relationship with the Supplier during the Accelerate engagement, after which the local MEP continues the Supplier client relationship for additional independent contract services.

- **MEP Supply Chain Advantage manages the deployment of MEP supply chain services for OEM accounts.**

Consistent deployment of services throughout the MEP network is an essential element of MEP success in regards to supplier development services. MEP Supply Chain Advantage (depicted in green arrows above) coordinates the service delivery for OEM accounts for their Suppliers and their local MEPs.

Phase I Activities Overview

The Accelerate Phase I project consists of the following activities:

1. **On-site [pre-project meeting](#).**
 - **MEP personnel:** One
 - **Duration:** Up to four hours
2. Two consecutive full-day VSM/MCT [project](#).
 - **MEP personnel:** Two
 - **Duration:** Two days
3. Follow-up activities extending through completion of Phase 2.
 - **MEP personnel:** One
 - **Duration:** Up to six hours

Pre-project Activities

Pre-project Overview

Note: To download a printer-friendly version of the **Pre-project Activities** topics, go to: www.wmep.org/accelerate.

- The MEP Supply Chain Advantage (SCA) deploys the local MEP to execute an Accelerate project by providing the local MEP center with Supplier contact information and an electronic copy of the executed Accelerate charter.
- This commences local MEP deployment of the Accelerate project.

Pre-project Step 1: Local MEP Initial Supplier Customer Contact

Goals

- Maintain momentum established by the Kickoff meeting by initiating Local MEP contact with Supplier within 48 hours of project charter signing.
- Set up on-site pre-project meeting with Supplier Leadership.

Activities

MEP makes appointment with Supplier for Pre-project meeting.

- Discuss potential project dates (requires 2 consecutive full days).
- Discuss whether the Supplier will invite OEM participation in the Phase I project.

Circumstances Requiring Local MEP Communication with MEP Supply Chain Advantage

- Supplier is not returning phone calls or e-mails, delaying the scheduling of the project.
- Supplier is not willing to commit adequate resources for a successful project.
- Earliest possible project dates extend beyond charter deadlines.
- Two consecutive full days are not possible for the Supplier.
- Part number or process family has changed from what was agreed to on the charter.
- Part or process is not actively on order by OEM.
- Project dates are rescheduled. Please make us aware so we can update the OEM.
- You have not received completed Supplier Profile Questionnaire and Supplier Lean Practices Self-Assessment from the MEP Supply Chain Advantage.
- Any circumstance jeopardizing the success of the project.

Pre-project Step 2: Project Preparation Meeting

Prior to on-site pre-meeting, MEP SCA Project Manager will hold a web-ex/telcon meeting with Local MEP Accelerate delivery staff.

Goals

- Review OEM Supplier Charter particulars (see [Appendix 1](#) for Generic Accelerate Project Charter)
- Review Supplier [Pre-project Questionnaire](#) and [Lean Self-Assessment](#).
- Review Accelerate process, if needed.

Pre-project Step 3: Local MEP Supplier On-site Pre-project Meeting

Goal

- Set the stage for executing a successful Accelerate project positioned to launch or support an enterprise-wide lean transformation and a successful long-term MEP mentoring relationship with Supplier.

Activities

Local MEP holds face-to-face pre-project meeting with Supplier to discuss the following:

- Introduce yourself and your MEP mission and consulting capabilities.
- Discuss the Accelerate project charter; confidentiality, etc.
- Confirm P/N or Process Family & data necessary for project.
- Discuss OEM demand. Confirm that P/N or Processes is actively required.
- Finalize Project Dates & Time. Review [Project Agenda](#) with Supplier.
- Discuss make up of project team and executive involvement/support. Ensure Supplier is committing the right resources for a successful project.
- Walk the Value Stream to observe the Supplier's current production process.
- Review Supplier Company Profile Questionnaire ([see Appendix 2](#)).
- Review Supplier Lean Practices Self-Assessment ([see Appendix 3](#)).
- Review any additional Supplier data collection requirements for project execution (if any).

Note: Following on-site pre-project meeting, send Project Dates to MEP Supply Chain Advantage Lead at Hayner@wmep.org.

Phase I Project Delivery Activities

Project Materials

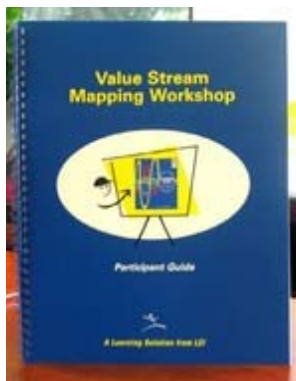
Note: To download a printer-friendly version of the **Project Delivery Activities** topics, go to: www.wmep.org/accelerate.

For Local MEP use

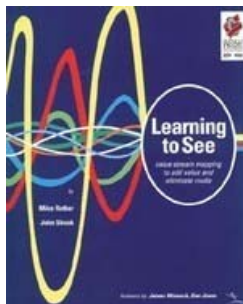
- [Lean Overview - 8 Wastes, Flow, and Lean Tools](#)
- [Value Stream Mapping Training](#) presentation
- [MCT and Time-based Continuous Improvement Training](#) presentation
- [Visio with E-VSM Plug-in](#)
- **E-VSM Accelerate Mapping Templates:** [EVSM Template v3](#) and/or [EVSM Template v4](#)

For Supplier use (to be provided by Local MEP)

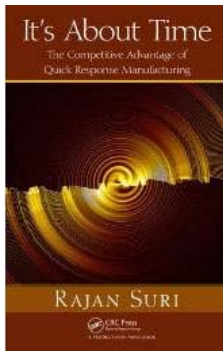
- **Value Stream Mapping Workshop Participant Guide** - workbooks for up to 10 participants. Available from www.lean.org.



- **Learning to See** - 1 copy. Please order from Amazon.com or your favorite book seller.



- **It's About Time** - 1 copy. Please order from [Amazon.com](https://www.amazon.com) or your favorite book seller.



- **Overview of Critical Concepts from “It’s About Time”** - 1 copy. The content is provided in [Appendix 5](#) and can be downloaded as a stand-alone, printable document from the [WMEP Web site](#).
- **Value Stream Mapping and Calendar Time Calculation Quick Reference Guidebook** - 1 copy. This can be downloaded as a stand-alone, printable document from the [WMEP Web site](#).



- **Electronic Data Collection Sheets for Value Stream Mapping.** The content is provided in [Appendix 4](#) and can be downloaded as stand-alone, printable documents from the WMEP Web site: [Manufacturing Data Sheet](#) and [Office Data Sheet](#).
- **Electronic Calendar Time Conversion Spreadsheet.** Please download from the [WMEP Web site](#).
- **Electronic Project Plan Spreadsheet.** Please download from the [WMEP Web site](#).

Phase I Project Agenda

Day 1

Time	Topic
7:00 am to 8:00 am	Arrive and set up for training and project
8:00 am to 8:30 am	Project Introduction, Charter and Agenda Review
8:30 am to 10:00 am	Lean Overview and Current State VSM Training
10:00 am to 12:00 am	Develop Current State VSM Path
11:00 am to 11:45 am	Discuss VSM path and data collection
11:45 am to 12:15 pm	Lunch
12:15 pm to 2:30 pm	Gather data for Current State Map
2:30 pm to 4:30 pm	Create Current State VSM
4:00 pm to 4:30 pm	MCT training & Current State MCT Map

Note: Day One can run longer than 4:30 pm.

Day 2

Time	Topic
7:30 am to 8:00 am	Arrive and prepare for project
8:00 am to 8:30 am	Project Progress Review
8:30 am to 9:30 am	Future State VSM Training
9:30 am to 11:30 am	Create Future State VSM
11:30 am to 12:15 pm	Lunch
12:15 pm to 1:30 pm	Finalize Future State VSM
1:30 pm to 2:30 pm	Project Planning
2:30 pm to 3:00 pm	Future State MCT Map
3:00 pm to 4:00 pm	Project Wrap-up and Next Steps Review

Day 1: Detailed Content

8:00am to 8:30am: Project Introduction

Goals

Establish the basis for the Accelerate project, which are:

1. To provide strategic continuous improvement resources
 - a. Lean tools for enterprise-wide transformation
 - b. Time-focused improvement mentality
 - c. MEP as mentor/ advisor
2. To strategic suppliers:
 - a. Not selected for bad performance, but strategic value to OEM.

Activities

- Introduce yourself and your MEP mission/capabilities
- Explain the Accelerate program
- Establish company specific goals for Supplier Project Charter with the project team
- Review Project Agenda

8:30am to 10:00am: Lean Overview and Value Stream Mapping Training

Goal

Introduce the Supplier to lean concepts and Value Stream Mapping methodologies to enable the project team to accomplish their activities.

Activities

- Lean Overview Training- Cover Eight Wastes with Examples, Concept of Flow, and Lean Tools
- Current State Value Stream Mapping Training
- Introduce Data Collection Sheets for Value Stream Mapping ([see Appendix 4](#))

10:15am to 4:00pm: Complete Current State Value Stream Map

Goal

Depict the typical information and material flow for targeted value stream to establish a baseline for identifying process improvement opportunities.

Note: See the [Value Stream Mapping and Calendar Time Conversion](#) section for instructions on making Value Stream Mapping and MCT calculations.

Activities

- Walk the flow with team to gather/confirm project data using Data Collection Sheets for Value Stream Mapping ([see Appendix 4](#))
- Involve team in creation of Current and Future State VSMs
- Create Electronic Value Stream Map using E-VSM Accelerate Macros
- Office Order Entry Process
- Raw Material Procurement and Inventory
- Production Process
- Logistics Process
- Contingency (Finished Goods) Inventory
- Production Timeline Office and Production for NVA and VA
- Complete Summary Boxes: Office, Production and Raw Material

4:15pm to 4:30pm: Complete MCT Map Training and Current State MCT Map

Note: Finish the Current State VSM before introducing MCT.

Activities

- [MCT and Time-based Continuous Improvement Training](#) presentation
- Complete the Current State MCT Map

Day 2: Detailed Content

8:00am to 8:30am: Review Current State Map

Activities

- Questions
- Review Current State Map
- Review project agenda

8:30am to 9:30am: Complete Future State Value Stream Mapping Training

Activities

- Complete Future State Value Stream Mapping Training

9:30am to 1:30pm: Complete Future State Value Stream Map

Activities

- Identify improvements to Current State by discussing the 8 Future State Questions:
 1. What is the takt time?
 2. Will we build to shipping or supermarket?
 3. Where can we use continuous flow?
 4. Where do we have to use supermarket pull system?
 5. At what single point can we trigger production?
 6. How do we level the production mix at the pacemaker process?
 7. What increment of work will we release and take away at the pacemaker?
 8. What supporting improvements will be necessary to sustain improvements?
- Draw the Future State VSM with the team
- Create Electronic Value Stream Map using E-VSM Accelerate Macros

1:30pm to 2:30pm: Complete the Project Plan

Activities

- For a sample completed Accelerate Project Plan Template, [see Appendix 6](#).

2:30pm to 3:00 pm: Complete the Project Report Template

Activities

- Complete Future State MCT Map
- Complete Project Report Template
- For a sample completed Phase I Project Report Template, [see Appendix 7](#).

3:00pm to 4:00pm: Project Wrap-up

Activities

- Get feedback from project team: Likes, Wishes, Lessons Learned
- Give project [deliverables](#) to Supplier at the end of the project
- Review Supplier's Next Steps:
 1. Supplier Review Phase I Report with MEP SCA
 2. Supplier Review Phase I Report with OEM
 3. Supplier meeting with Local MEP within 2 weeks to discuss Phase II project Implementation

Day 2: Project Deliverables

The project deliverables are:

- Current State VSM and MCT Maps
- Future State VSM and MCT Maps
- Project Implementation Plan (Excel Template)
- Presentation Template Completed with Deliverables

Send project deliverables to MEP Supply Chain Advantage Lead at Hayner@wmep.org.

Phase I Follow-up Activities

Local MEP Project Review with MEP SCA

Goal

To assess the Accelerate project process and outcomes for consistency, accuracy, results, and improvement opportunities.

Activities

MEP SCA will set up a web-ex/telcon meeting for the following activities:

- Review of deliverables with MEP SCA
- Local MEP Project Assessment ([see Appendix 8](#))
- Preliminary Project Financial Impact ([see Appendix 9](#))

Local MEP Phase I Follow-up with Supplier

Activities

Local MEP will contact Supplier every four to six weeks until Phase 2 is complete to:

- Discuss progress on Accelerate project plan.
- Explore opportunities for additional MEP assistance relative to project plan.
- Discuss opportunity to assist Supplier to develop “Next Steps” one year executive systematic continuous improvement strategy.
- Support Supplier Phase II reporting requirements.
- Prep client for NIST survey in 9 months.

Supplier Phase II Reporting Requirements

- Gap Closure Projects Completed by charter date
- MCT Achieved State Map
- Develop “Next Steps” one year executive continuous improvement strategy
- Update Phase 2 Report Presentation
- Phase 2 Review Meeting with MEP SCA prior to OEM meeting
- Phase 2 Review Meeting with OEM

Value Stream Mapping and Calendar Time Conversion

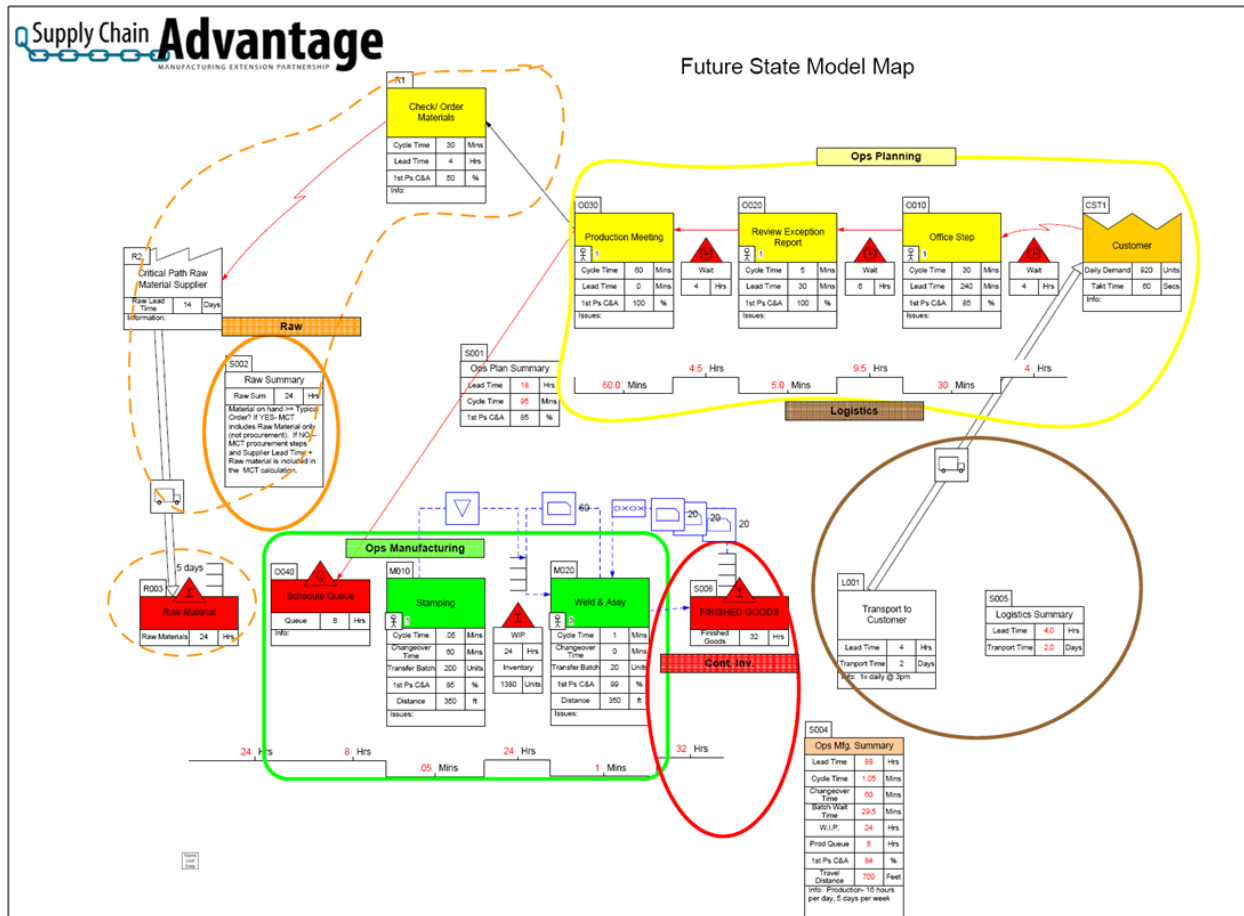
Introduction

Note: To download a printer-friendly version of the **Value Stream Mapping and Calendar Time Conversion** topics, go to: www.wmep.org.

Also Note: To view online instructional videos that demonstrate the Value Stream Mapping and Calendar Time Conversion tools, go to www.wmep.org.

The Accelerate process introduces small-to-medium sized manufacturing businesses to a simple process they can use to identify, implement, and measure improvements to their entire production process. Two powerful tools are used in this process:

- **Value Stream Mapping (VSM):** VSM depicts the flow of information and materials required to process an order, procure materials, produce the product, and ship the product back to the customer. The data associated with each icon in the map allows everyone to easily identify and discuss opportunities for improvement.
- **Manufacturing Critical-path Time (MCT) metric:** MCT quantifies VSM's true lead time in calendar days, which represents the customer viewpoint.



Although the Value Stream Mapping and the Manufacturing Critical-path Time (MCT) tools can be used independently, when these tools are used in combination, a synergistic effect is unleashed. For example, in order to interface with MCT, the Value Stream Map must collect data regarding batch size and the order entry process, resulting in a more robust understanding of the value stream. Likewise, by providing a true calendar time representation of the value stream, when it comes to planning improvements, the MCT calculations benefit from the more robust visual depiction of the process provided by the Value Stream Map.

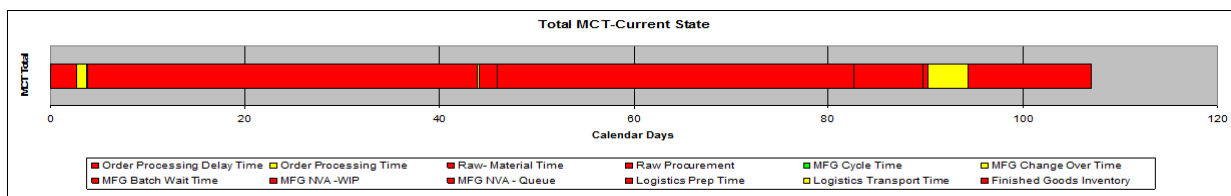
Work Time vs. Calendar Time

When it comes to the standard VSM timeline and Manufacturing Critical-path Time metric, you must keep in mind the following measurement differences:

- VSM measures everything relative to the work time available and does not take weekends or shift downtime into account.
- Manufacturing Critical-path Time (MCT) provides an easily understood metric that measures everything in calendar time.

There are several benefits to calendar time:

- MCT is valuable as a measurement supply chain order fulfillment, providing both suppliers and customers a measurement of current capabilities and a common focus for improvement efforts.
- Calendar days provide a consistent measurement for firms, no matter how widely they may differ with respect to the products they produce or their production work-time-availability.
- MCT represents the viewpoint of the customer, and as such, provides an essential perspective in the world of supplier/customer interface and lean improvements.



For these reasons, the MEP network has adopted VSM as a standard tool and integrated the use of the MCT metric into the VSM process through the Calendar Time Conversion Calculator. The information presented here has been developed to support the consistent combined use of VSM with the Calendar Time Conversion Calculator.

Preparing the Value Stream Map for MCT Conversion

Overview

Note: To download a printable example of an Accelerate Value Stream Map, go to www.wmep.org.

The instructions provided in this section supplement and support the standard Value Stream Mapping process as presented in the book [Learning to See](#) by Mike Rother and John Shook. This section provides an explanation of the Value Stream Mapping template deployed in the Accelerate process, which in turn supports the use of the Calendar-Time Conversion Calculator.

Although complex Value Streams that involve multiple components can be fully represented on a Value Stream Map, the essential mapping calculations are those which are part of the critical path (the path that represents the longest lead time). If you have multiple parallel paths of material or information flow, the longest path is the critical path and should be the basis for the Value Stream Map timeline and subsequent MCT calculations.

All measurements on the Value Stream Map should be recorded relative to the work time available, not actual calendar time. In other words, on the Value Stream Map, hours should be normal working hours available per week and days should be normal work days.

How to Convert Inventory Into Time

Value Stream Mapping converts inventory into "time relative to work days available" by performing the following steps:

1. Identify the **average customer demand per month**
2. Identify the **work days available per month**
3. Identify the **average daily demand** by dividing the **average customer demand per month** by **work days available per month**.
4. Identify the **work in progress (WIP)** by dividing the **observed pieces of inventory** by the **customer demand rate**.

Example

1. Average customer monthly demand = 18,400
2. Work days available per month = 20 (no weekends or holidays are used in this example)
3. Average daily demand = 920 pieces per available work day ($18,400 / 20$)
4. 2,500 pieces of work in progress (WIP) = 2.72 work days of WIP ($2500 / 920$)

VSM Loops

To better manage the Value Stream Mapping data, it is important to summarize the data according to the major sections (or "loops") of the Value Stream Map. The Value Stream Map is divided into the following five loops:

- [Operations Planning \(Office\) loop](#)
- [Raw Material and Procurement loop](#)
- [Operations Manufacturing loop](#)
- [Logistics loop](#)
- [Contingency Inventory loop](#)

Operations Planning (Office) Loop

The Operations Planning Loop begins from the point of the customer release of the order. It follows the information flow until a production order is released to Manufacturing Operations. It does not include material procurement activities.

Ops Plan Summary Table

S001	Ops Plan Summary	
Order Delay Time	16	Hrs
Order Process Time	331	Mins
1st Ps Prfct	85.4	%

- **Order Delay Time:** Is the total of all non-value add office activity, including: Wait Time, Queue Time, and Batch Wait Time. It begins with the customer order and follows the information flow through issuance of the production order to the floor.
To compute: Add the Wait Time and Queue Time between each step, and also add the additional Batch Wait Time that is part of the step (if it's different than the required cycle time).
- **Order Processing Time:** Is the total of all necessary touch time to move information from the customer to Manufacturing Operations.
To compute: Add the step touch times.
- **1st Pass Perfect:** Is the total overall percentage of orders that go through the processing step without a delay due to incomplete or inaccurate information or processing.
To compute: Multiply the entire 1st Pass Perfect In and Through measurements for all the production steps. For example: $96\% \times 85\% \times 100\% \times 100\% \times 50\% = 40.8\%$ 1st Pass Perfect In and Through.

Raw Material and Procurement Loop

The Raw Material Loop includes all procurement activities, the supplier lead time, and the raw material held on hand that pertains to the critical production path. The Raw Material Loop consists of two parts:

- **Raw Procurement:** Includes the purchasing activities and raw material supplier lead time for the critical path component in a non-expedited disposition. This is not part of the VSM time-line.
- **Raw Material:** Includes all raw materials on hand for the critical path component.

Raw Material Summary Table

Raw Material includes:

- The time represented by the raw material for the critical path component
- The time represented by any kitted material
- The total procurement time for the critical path component

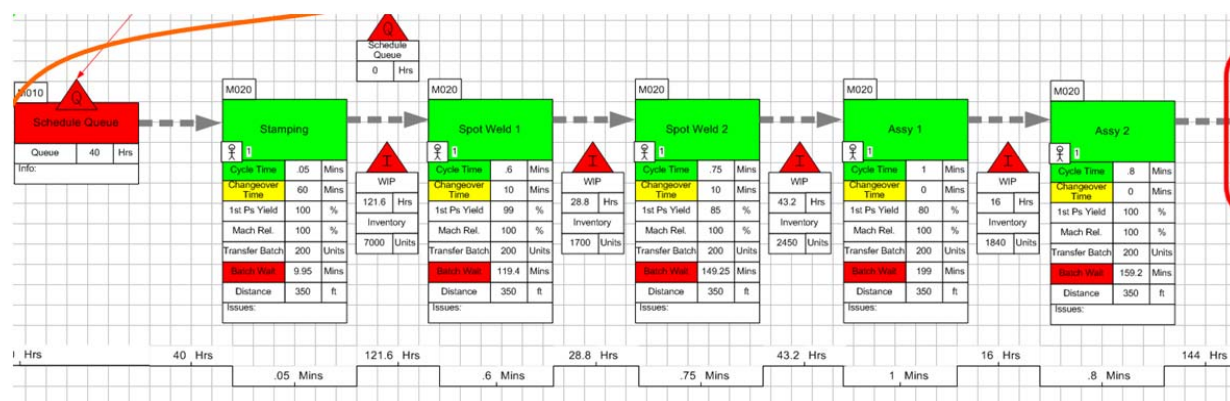
S002		
Raw Mat'l Summary		
Raw Inv	80	Hrs
Kitted Inv	0	Hrs
Total Procure Time	15.02	Days
Total Procure Time= Supplier Lead Time + office procurement Time + materials handling/receiving		

Operations Manufacturing Loop

The Operations Manufacturing Loop includes all non-value and value-added activity from the Raw Material loop through the critical production path until a finished product has been produced. This includes:

- The production schedule queue
- The cycle time for all the production steps, as well as the change over times
- The batch wait times
- The time represented by the Work in Process Inventory (WIP)
- The queue time waiting on shared resources

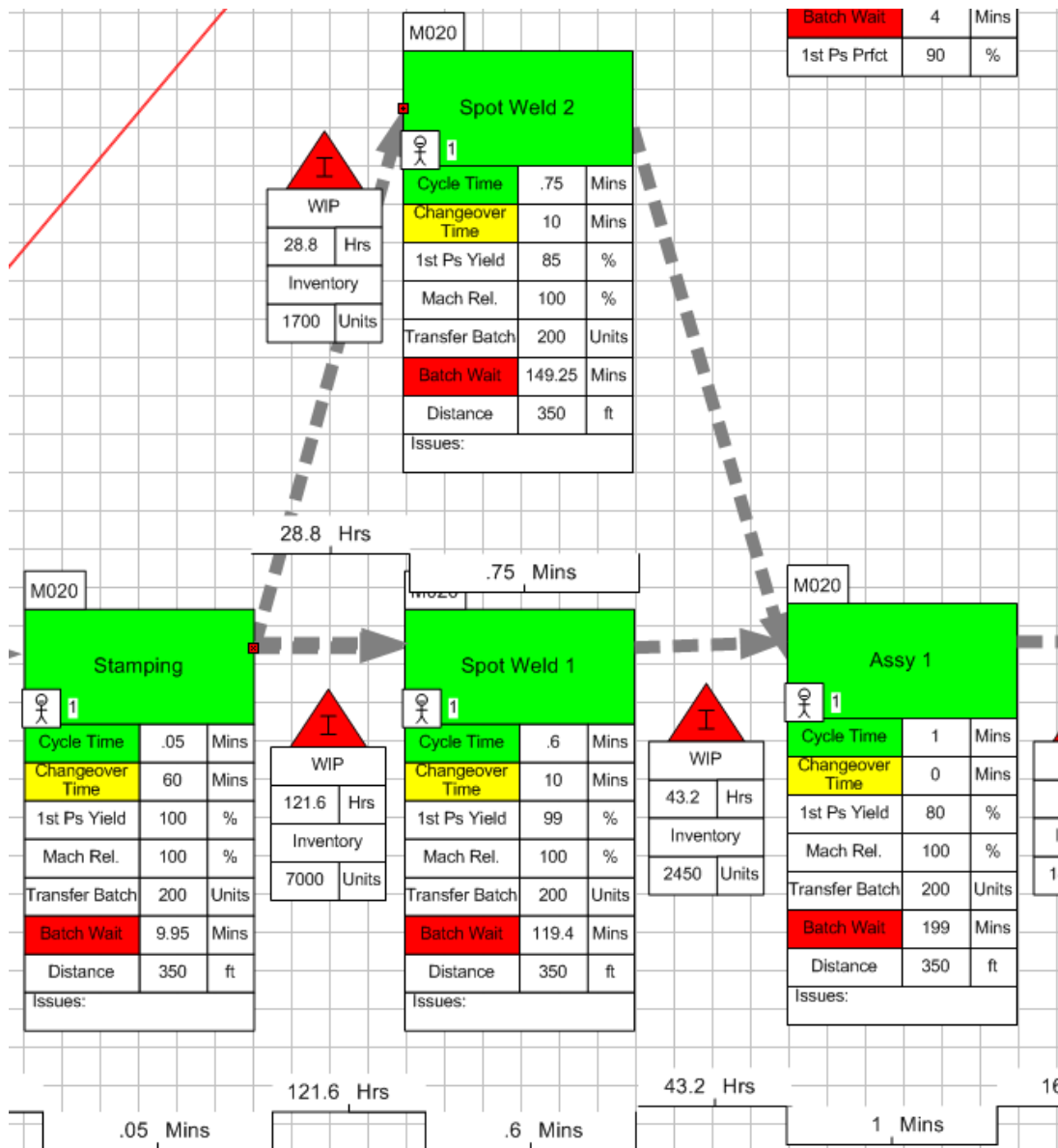
The Operations Manufacturing Loop does not include packing, shipping or finished goods inventory.



Determine the Critical Path of Production

If more than one production path exists, the critical path is the path with the longest lead time.

In the example provided here, Spot Weld 1 and 2 are running in parallel and both feed into Assembly 1. Spot Weld 2 has 28.8 hours of WIP and a .75 minute cycle time, whereas Spot Weld 1 has 121.5 hours of WIP and a .6 minute cycle time. Spot Weld 1 is the longest path and thus the critical path.



Operations Manufacturing Summary Table Calculations

This section provides an explanation of the components that make up the Operations Manufacturing Summary table.

- **Lead Time:** Total of all NVA (non-value add) activity in the critical production path, including Raw Material Inventory, and the WIP and Queue between production steps, through the completing of a finished product. This is a standard VSM measurement.
- **Cycle Time:** Total of all the Cycle Time in the critical production path. This is also a standard VSM measurement.
- **Changeover Time:** Total of all the change over time in the critical production path.
- **Batch Wait Time:** For each production step, multiply the number of units in the transfer batch size minus 1 times the cycle time for that step to get the batch wait time for this step.

Example: Transfer batch of 200-1=199 x .05 min= Batch wait of 9.95 minutes.

To get the total Batch Wait Time, add the batch wait time for each step to get the total batch wait time for the critical production path.

- **W.I.P.:** Add the total of the manufacturing non-value add values that are due to WIP in the production loop.
- **Queue:** Add the total of the manufacturing non-value add values that are due to Queue times in the production loop.
- **1st Pass Quality Yield:** Multiply all the 1st Pass Yield measurements for all the production steps.

Example: 96% x 85% x 100% x 100% x 50% = 40.8% 1st Pass Yield.

This gives you the overall percentage of parts that go through the value stream without defects, scrap, or rework on the first pass.

- **Machine Reliability:** Multiply all the machine reliability measurements for all the production steps in the same manner as 1st Pass Quality Yield. This gives you the total percent of time that all machines required for this value stream are in proper working order.
- **Travel Distance:** Add the distance traveled (in feet) by the material from Raw Material to Finished Goods.

S004		
Ops Mfg. Summary		
Lead Time	433.6	Hrs
Cycle Time	3.2	Mins
Changeover Time	1.3	Hrs
Batch Wait Time	642	Mins
W.I.P.	209.6	Hrs
Queue	40	Hrs
1st Ps Yield	67.3	%
Mach Rel.	87%	%
Travel Distance	1750	Feet

VSM Production Timeline

The non-value add values in the VSM production timeline are made up of WIP and Queue Time. Do not include raw material, kitted material, or finished goods inventory in WIP or Queue totals since they are included in their respective categories.



Logistics Loop

The Logistics Loop includes all the wait time and activities in the shipping of a finished product. This includes:

- Packing
- Waiting on the shipping dock
- Transport time through physical receipt of the goods by the customer.

The legal transfer of ownership is irrelevant to this mapping exercise, which focuses on the physical flow of goods.

Logistics Summary Table

- **Logistics Prep Time:** The typical time the finished product is awaiting shipment, including packing activities, waiting, and loading.
- **Transport Time:** Time required to transport the finished goods from the supplier dock to the customer dock.

L030		
Transport To Customer		
Prep Time	4	Hrs
Transport Time	2	Days
Info: 1x daily @ 3pm		

Contingency Inventory Loop

The Contingency Inventory Loop refers to all finished goods inventory as distinct from WIP.

The Contingency Inventory is part of the Value Stream Mapping Production Lead time calculation, but for the purposes of MCT is considered a separate loop distinct from the Operations Manufacturing Loop. The Contingency Inventory does not require a summary table since it is a stand alone measure.

Calculating the MCT Measurement

Calculating the MCT Measurement

Entering VSM Values into Calendar Time Conversion Sheet

Use your completed value stream map to make the required entries to the calendar time conversion sheet. The MCT calculation requires 14 step entries from the Value Stream Map. After completing the 14 steps the final calculations are [displayed on the conversion sheet](#).

Step 1 - Order Processing Delay Time

From the Ops Plan Summary Table on your VSM, enter the Order Processing Delay Time onto the Calendar Time Conversion spreadsheet. Then enter the work hours per day and the work days per week (e.g. 8 hours, 5 days per week). You'll do this for each step.

Calculating the MCT Measurement: Steps 2 and 3

Step 2 - Order Processing Time

From the Ops Plan Summary Table on your VSM, enter the Order Processing Time. Then enter the work hours per day and the work days per week (e.g. 8 hours, 5 days per week).

S001	Ops Plan Summary		
Order Delay Time	16	Hrs	
Order Process Time	331	Mins	
1st Ps Pnct	85.4	%	

CALENDAR TIME CONVERSION SHEET						CURRENT STATE	
CRITICAL PATH Step VSM Summary Metric Name		Step Duration Entries in Work time Available			Work Hours Per Day	Work Days per Week	MCT
		Days	Hours	Mins			
1	Order Processing Delay Time		16		8	5	2.80
2	Order Processing Time		5	31	8	5	0.97
3	Raw- Material Time	0	80		8	5	14.00
4	Raw Procurement	0	0		8	7	0.00

R010	Raw Material		
Raw Materials	80	Hrs	
Raw Materials	1297	Units	

Step 3 - Raw Material Time

From your VSM, enter the time for the Raw Material Inventory on Hand. Then enter the work hours per day and the work days per week (e.g. 8 hours, 5 days per week). Raw Material uses the same work hours per day and work days per week as the Manufacturing Loop. Kitted Raw Material is included in Raw Material on Hand, not WIP. Time for kitting activities (but not material) is included in the production loop.

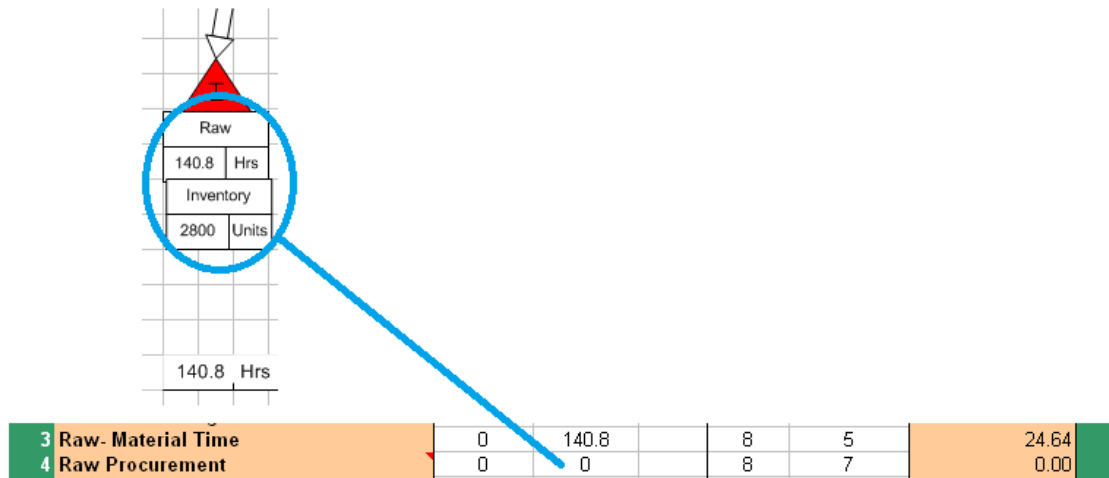
Calculating the MCT Measurement: Step 4

Raw Procurement

Raw procurement time is not always part of the Manufacturing Critical-path Time, and therefore is not always entered in the Calendar Time Conversion spreadsheet.

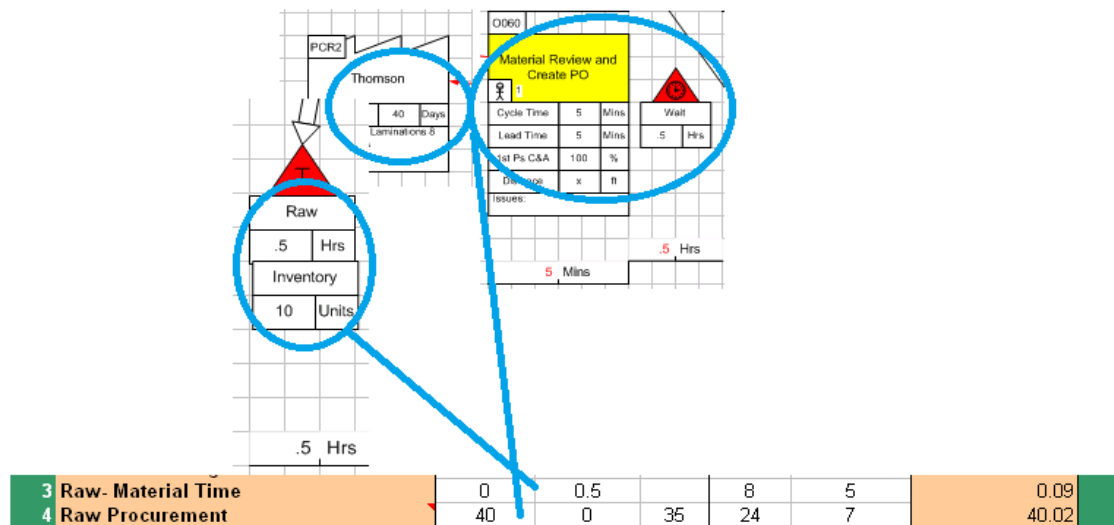
- If the Raw Material on Hand ***is*** sufficient for a typical customer order quantity, you ***do not*** enter the procurement time. Enter 0 for Raw Material procurement Lead Time and go on to line 5, MFG. Cycle Time.
- Typical order quantity is best selected by reviewing previous orders and selecting a typical quantity. Compare that quantity to the amount of raw material on hand.

For example, if your typical customer order quantity is 1000 pieces, and your Raw Material on hand is 2800 units, enter the time value (140.8 hours) for line 3. Leave line 4 as 0 and go to line 5.



- If the Raw Material On Hand ***is not*** sufficient for a typical customer order quantity, enter the Raw Procurement Lead Time and Cycle Time (in addition to any Raw Material on Hand). This would include the total time of the procurement activities and the supplier lead time in a non-expedited disposition.

For example, if your typical customer order quantity is 1000 pieces, and your Raw Material on hand is 10 units, enter the time value (.5 hrs) for line 3. Then add the time for procurement activities and the supplier lead time in line 4. In the example below, you would enter 40 days and 35 minutes (.5 hour wait and 5 minutes of procurement cycle time and 40 days of supplier lead time.) Enter the work hours and work days per week at which the Raw Procurement activities are factored. Typically the supplier lead time is already in true calendar time. In this case, enter 24 hours and 7 days for the conversion factor.



Calculating the MCT Measurement: Step 5

MFG Cycle Time

From the Ops Mfg. Summary Table on your VSM, enter the Cycle Time Total. This is the total of the Value Added Time for one piece in production through the critical path. Then enter the normal work hours per day and the work days per week for the manufacturing floor. If different departments have differing work hours and work days per week, take the smaller working period as the conversion factor.

Example: Plant ABC runs production on a 2 shift 6 days per week, but the welding department only runs 8 hours per day 5 days per week. Enter 8 hours per day and 5 days per week as the conversion factor for the production steps.

Calculating the MCT Measurement: Steps 6, 7, 8, and 9

Step 6: MFG Change Over Time

From the Ops Mfg. Summary Table on your VSM, enter the Changeover Time total. This is the total of all the change-overs for all production steps through the critical path of production.

Step 7: Batch Wait Time

From the Ops Mfg. Summary Table on your VSM, enter the Batch Wait Time total for the critical production path.

Step 8: MFG NVA- WIP

From the Ops Mfg. Summary Table on your VSM, enter the Total Production NVA- WIP (non-value add work-in-process)

Step 9: MFG NVA Queue

From the Ops Mfg. Summary Table on your VSM, enter the Total Production NVA- Prod Queue

S004							
Ops Mfg. Summary							
Lead Time	433.0	Hrs					
Cycle Time	3.2	Mins					
Changeover Time	1.3	Hrs					
Batch Wait Time	642	Mins					
W.I.P.	209.6	Hrs					
Queue	40	Hrs					
1st Ps. Hold	67.6	%					
Mach Rel.	87%	%					
Travel Distance	1750	Feet					

5	MFG Cycle Time	0	0	3.2	8	5	0.01
6	MFG Change Over Time	0	1.3	0	8	5	0.23
7	MFG Batch Wait Time	0	0	642	8	5	1.87
8	MFG NVA -WIP	0	209.6		8	5	36.68
9	MFG NVA - Queue	0	40	0	8	5	7.00

Calculating the MCT Measurement: Step 10

Logistics Prep Time

From the Logistics Summary Table on your VSM, enter the Logistics Lead time in your conversion table. Enter work hours per day and the work days per week of the shipping department.

L030							
Transport To Customer							
Prep Time		3	Hrs				
Transport Time		3	Days				
Info: 1x daily @ 3pm							

10	Logistics Prep Time		3	0	8	5	0.53
11	Logistics Transport Time	3			24	5	4.20

Calculating the MCT Measurement: Steps 11 and 12

Step 11 - Logistics Transport Time

From the Logistics Summary Table on your VSM, enter the Transport time in your conversion table. Enter 24 hours per day and the work days per week that material is received for the conversion factor for this step.

Step 12 - Finished Goods Inventory

If present, enter the Contingency Inventory (All Finished Goods) from your VSM into your conversion table. Use the work hours per day and work days per week of your production loop for the conversion factor for this step.

Distance traveled and Mfg 1st Pass Perfect do not affect the calendar time calculation, but are included on the calendar time conversion sheet to track improvements in these areas relative to the value stream.

F010		I		FINISHED GOODS	
Finished Goods	8280	Units			
Finished Goods	144	Hrs			

12	Finished Goods Inventory	0	144	16	5	12.60
Total						59.69
MFG Distance Traveled		1750		Feet		
MFG 1st Pass Quality Yield%		67.3		%		
Response						46.62

Calculating the MCT Measurement: Steps 13 and 14

Step 13 - Distance Traveled

Enter the total number of feet the material travels from raw material through shipment of finished goods.

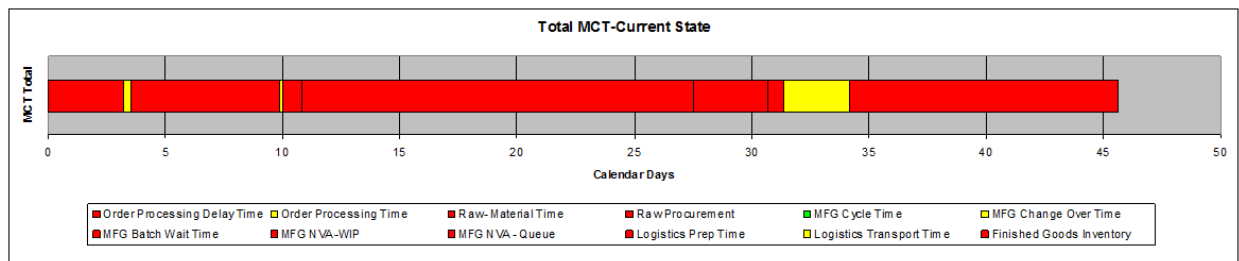
Step 14 - Mfg 1st Pass Quality Yield

Enter the total 1st Pass Quality Yield measurement for the [critical production path](#).

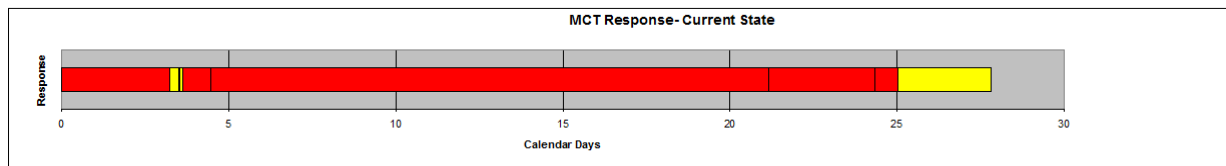
Understanding the Calendar Time Calculations

After completing the 14 MCT measurement steps, the following calculations are displayed on the Calendar Time Conversion Sheet:

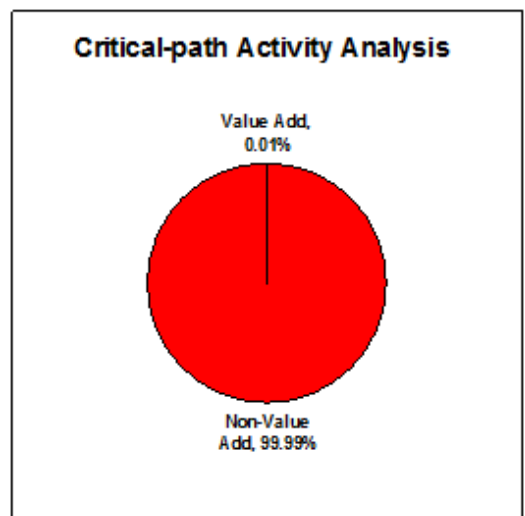
MCT Total: This is the total true lead time for the critical path of the value stream in calendar days in a non-expedited, First In, First Out flow.



MCT Response: This is a subset of the MCT total, excluding Raw Material and Finished Goods on hand. It measures the activities associated with order fulfillment. This metric is especially relevant to operational flexibility and order fulfillment capabilities.

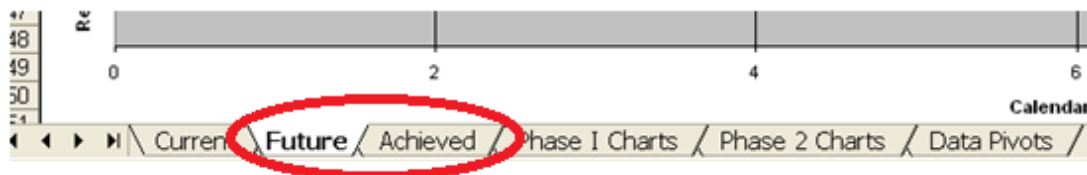


Critical-path Activity Analysis: This compares the amount of "value added activity" to "non-value added activity" relative to the first piece of an order. As in the Value Stream Map, Value Add is taken from the viewpoint of the first single piece.



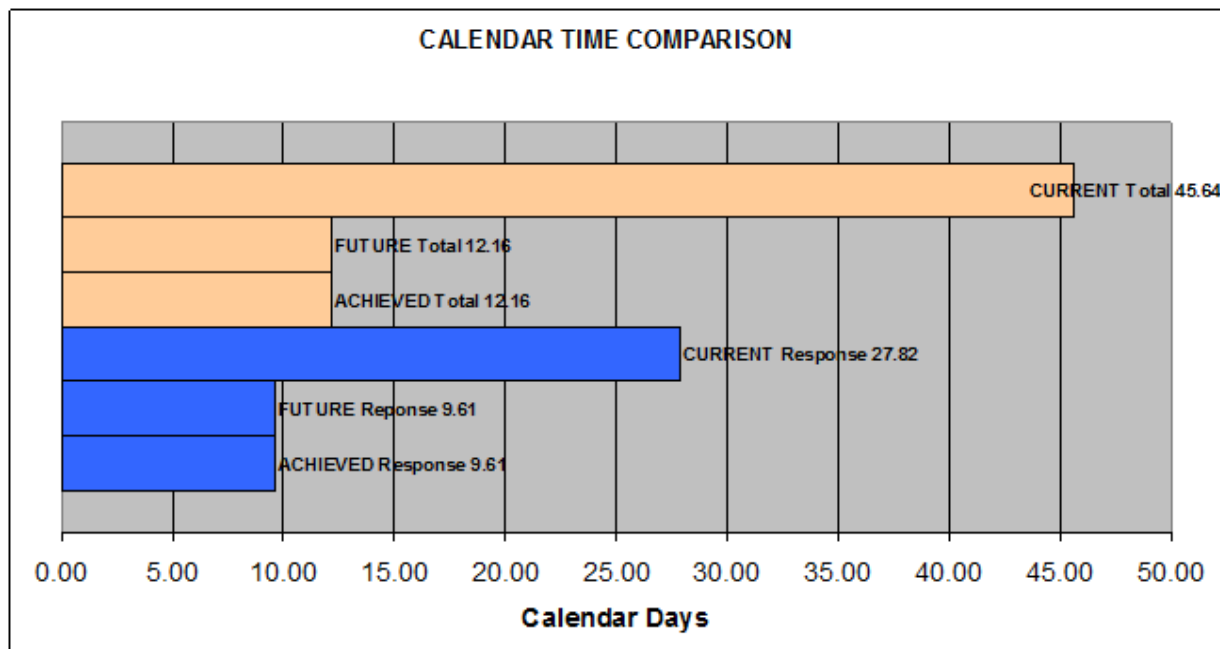
Comparison Charts

Once the current state is completed, additional “future” and “achieved” calculations can be created by selecting and completing these respective sheets.



Whenever future or achieved state are completed, charts comparing the data from these sheets to the Current sheet are automatically generated.

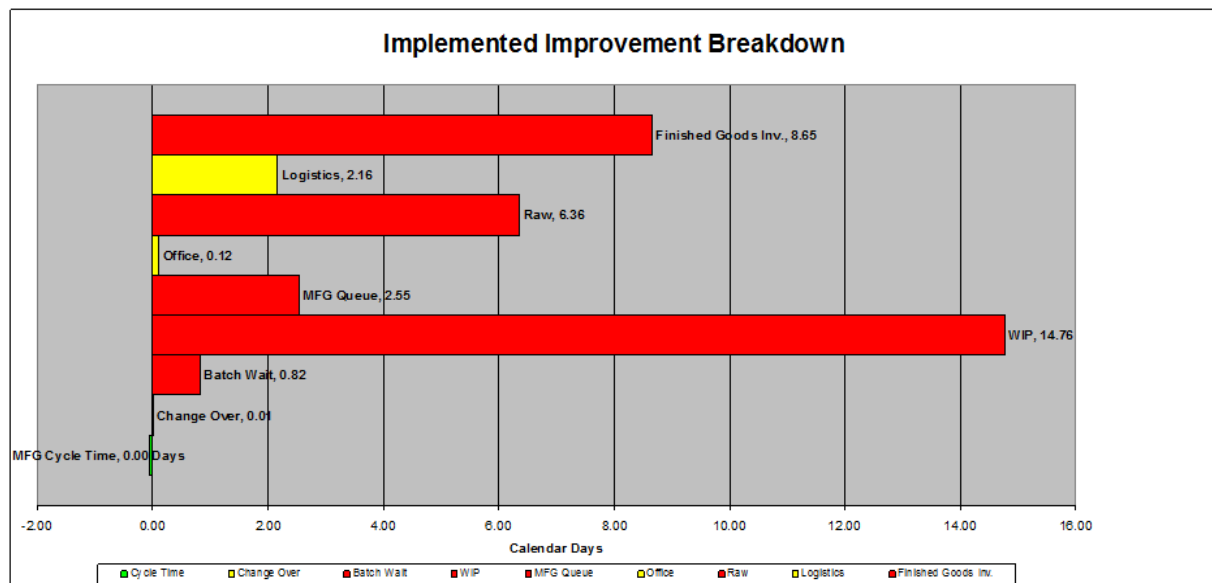
These Calendar Time Comparison charts can be viewed by selecting the **Phase I Charts** tab, which compares Current and Future, or by selecting the **Phase II Charts** tab, which compares Current and Achieved.



Below the Calendar Time Comparison charts, a detailed **Improvement Breakdown** chart is also generated. It is based on a comparison between the Total MCT values of the Current / Future states or the Current / Achieved states. The Improvement opportunity is stated both in Calendar days and as a percentage of improvement compared to the current state as the “baseline.”

This analysis chart is presented in order to visually display the amount of improvement in the various segments of the Value Stream. This chart breaks down the number of calendar days of improvement in the following specific categories:

- Contingency inventory (finished goods)
- Logistics
- Raw material
- Office processing
- Mfg. queue time
- WIP inventory
- Batch wait time
- Change over
- Mfg. cycle time



Finally, below the Improvement Breakdown chart, improvement in the distance traveled and the 1st Pass Quality at the source are displayed. These charts can be effective tools to track and communicate the areas of improvement recognized through the mapping process.

Frequently Asked Questions

Question

What should I do when I have a number of different raw materials coming into the value stream at different points and being assembled?

Answer

Track each one on the value stream map. For the summary totals and calendar time conversion, use the values for the items and processes that represent the critical-path (the longest lead time).

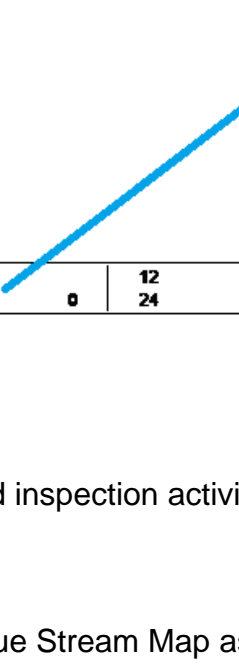
Question

What should I do with kitted raw material that is separate from raw material inventory?

Answer

Even if the raw material is kitted, it should be considered raw material for the sake of MCT mapping.

In this example, 80 hours worth of raw material is in inventory, and 10 hours of raw material has been kitted. Step 3 in the Calendar Time Conversion Spread sheet should be 90 hours for Raw Material Time.



S002		Raw Mat'l Summary			
Raw Inv	80	Hrs			
Kitted Inv	10	Hrs			
Total Procure Time	14.02	Days			
Total Procure Time = Supplier Lead Time + office procurement Time + materials handling/receiving					

3	Raw- Material Time	0	90	12	5	10.50
4	Raw Procurement	0	0	24	7	0.00

Question

Where should I include the material receiving and inspection activities prior to the receiving of raw materials into inventory?

Answer

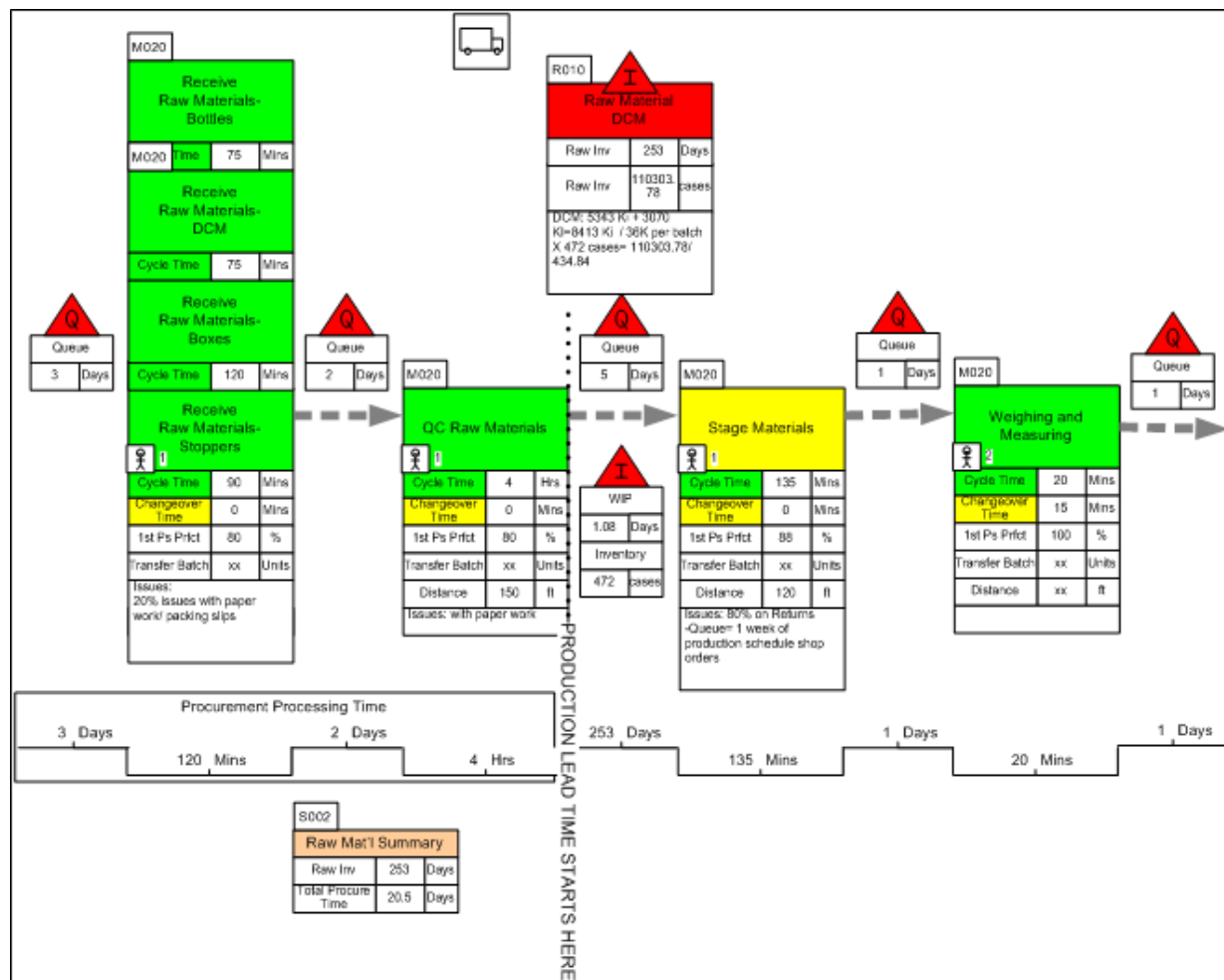
While these activities can be depicted on the Value Stream Map as “production processes” and often represent improvement opportunities, these activities are actually part of the procurement process. The time for these activities should be captured as part of the total procurement time and not included in the production time-line.

Consequently, these activities would not be included in the MCT calculation unless raw material procurement time is included ([see MCT Measurement: Step 4](#)).

In the example below, significant time was spent receiving and inspecting raw materials before it was put into storage. These activities, while captured on the VSM, are not included in the production time-line.

The time for these activities is part of the total procurement time in the Raw Material Summary.

Production lead time begins with raw material inventory, represented by the dotted line.



Question

Where should I include time for activities after the product is finished, such as inspection, material handling, packing, and shipping?

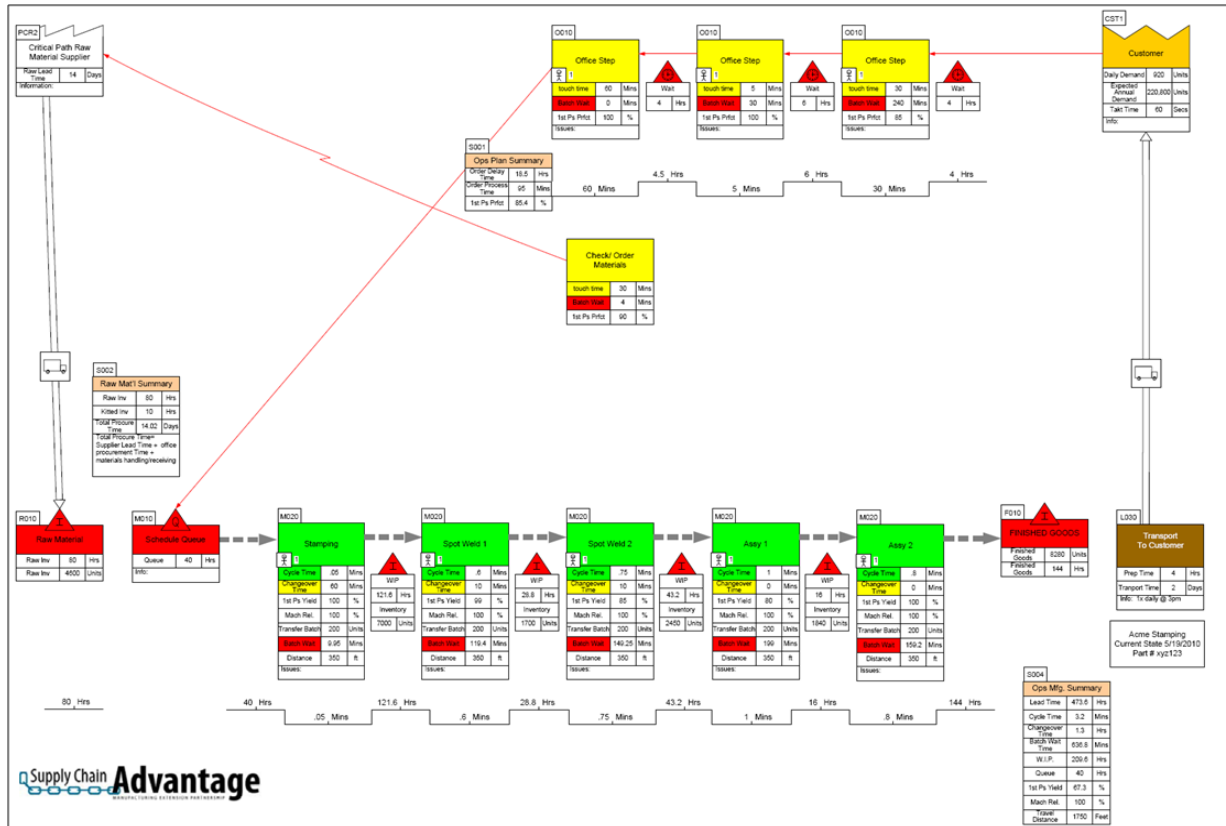
Answer

These activities are depicted on the Value Stream Map as separate steps or included under the “logistics prep” time. The typical depiction is captured in the table below:

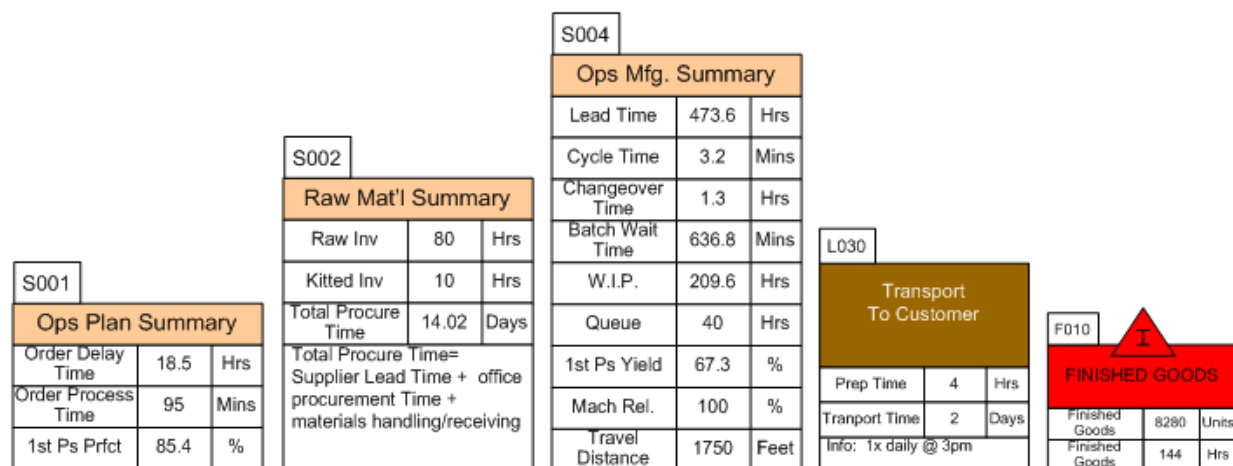
Activity	Shown on VSM	Included In VSM Timeline?
Finished Goods Inspection	Yes, as separate step	Yes, normally part of production time
Moving material into FG storage	Yes, as separate step	Yes, normally part of production time
Finished Goods Inventory	Yes, as inventory	Yes. Adds to production time
Pulling material out of FG storage	No, include in logistics prep	No. Part of Logistics prep time
Packing to ship	Usually not; included in logistics prep.	No. Part of Logistics prep time
Loading onto Truck	No	No. Part of Logistics prep time

Samples

Sample Value Stream Map



Summary Boxes from the Sample Value Stream Map



Corresponding Calendar Time Conversion Sheet

CALENDAR TIME CONVERSION SHEET					CURRENT STATE			
CRITICAL PATH		Step Duration Entries in Work time Available			Work Hours	Work Days		
Step	VSM Summary Metric Name	Days	Hours	Mins	Per Day	per Week	MCT	
1	Order Processing Delay Time		18.5		8	5	3.24	
2	Order Processing Time		0	95	8	5	0.28	
3	Raw- Material Time	0	4		12	5	0.47	
4	Raw Procurement	0	0	0	24	7	0.00	
5	MFG Cycle Time	0	0	3.2	12	5	0.01	
6	MFG Change Over Time	0	1.3	0	12	5	0.15	
7	MFG Batch Wait Time	0	0	636.8	12	5	1.24	
8	MFG NVA -WIP	0	209.6	0	12	5	24.45	
9	MFG NVA - Queue	0	40	0	12	5	4.67	
10	Logistics Prep Time		4	0	8	5	0.70	
11	Logistics Transport Time	2		0	24	5	2.80	
12	Finished Goods Inventory	0	144		12	5	16.80	
						Total	54.80	Days
MFG Distance Traveled		1750		Feet				
MFG 1st Pass Quality Yield%		67.3		%	Response 37.53 Days			
Company:	Acme Stamping				Value Add	0.01%		
Product:	xyz123 part							
Date:	5/19/2010				Non-Value Add	99.99%		

Appendix 1: Generic Accelerate Project Charter

Project Charter

The primary purpose of the Accelerate project charter is to define and document the project deliverables as agreed to by the supplier, the OEM, and MEP. To support these deliverables, the project charter identifies the organizational champions, the project time-line, and the project scope.

An example of a [generic Accelerate project charter](#) is available on the Web site.

Appendix 2: Pre-Project Supplier Company Profile Questionnaire

Note: A [printer-friendly version of this questionnaire](#) is available on the Web site.

All answers are held confidential between MEP and supplier. Data is used for MEP program execution and program assessment and is reported only in aggregate anonymously.

Supplier Company Name:_____ **Date:**_____

Supplier Personnel Completing Questionnaire:

Phone:_____ **Email:**_____

1. Organization Profile:

- a. Which best describes your organization? (Select one)
 - Independent Company
 - Division/Unit of Larger Company
- b. What is the 6 digit NAICS code (or SIC) for your organization?
- c. Please provide a brief description of your main product(s)?
- d. Please briefly describe the main production competencies of your company (e.g. machining, stamping, assembly, etc.?)

2. Products Sales Profile:

- a. Which best describes the majority of your company's production volume? (Select one)
 - One of a Kind / Custom Products
 - Short-term / Non-repeating
 - Long-term / Repeating, Low Volume Runs
 - Long-term / Repeating, High Volume Runs
- b. Total Annual Sales Revenue (all products) for the previous year?
- c. Percent of sales that went to cover materials and outside services for the previous year? _____ %

d. Over the past 3 years, Total Annual Sales revenue has: (Select one)

- Increased_____%
- Decreased_____%

e. Number of SKUs in active production at this location (ballpark # is fine)?
_____.

f. What percent of your sales are products that are assemblies of two or more parts?_____%

g. What percent of your sales are products your company designed the part or assembly?_____%

e. Approximately what percentage of your current sales are products not offered 3 years ago?_____%

3. Customer Profile:

a. Which best describes your primary customer base? (Select one)

- End-use Customers, Wholesalers, Distributors
- Original Equipment Manufacturers (OEMs)
- Tier 1 OEM Suppliers
- Tier 2 OEM Suppliers

b. Total estimated customer sponsored man hours (all customers) for performance improvement events for this plant location in the past 3 years (NOT including this Accelerate project)? (Select one)

- 0
- 1 - 20
- 21 - 40
- 41 - 60
- More than 60

c. Approximately how much of your annual sales revenue comes from the OEM customer sponsoring this Accelerate project?_____%

4. Workforce Profile:

a. Average TOTAL number of FTEs (full-time equivalents) at this location in the past year (including part-time and contract labor)?

b. Average total number of PRODUCTION FTEs (direct and indirect)?

c. How many of your Production employees are represented by labor unions?

d. What percent of your Production employees are skilled?_____%

- f. In the past year, what was your employee turnover rate? _____%
- g. What percentage of employees regularly participates in empowered work teams for continuous improvement activities (i.e. make decisions without supervisor approval)? _____%
- h. How many formal training hours are devoted annually to each employee? (Select one)
- 0
 - 1 - 8
 - 9 - 20
 - 21 - 40
 - More than 40
5. What is the percent of deliveries on time for the past year (all products, all customers)? _____%
6. What is the percent of deliveries achieving customer approved quality in the last year (all products, all customers)? _____%
7. Inventory Profile:
- a. Compared to 3 years ago, the average total inventory on hand (Raw, WIP and finished) at this location is:(Select one)
- Reduced Significantly (10%+)
 - Reduced Slightly (1% - 9%)
 - Remained About the Same
 - Increased Slightly (1% - 9%)
 - Increased Significantly (10%+)
- b. What was your company's average inventory turns for the past year for this location? _____%
- c. How much total inventory (Raw, WIP, and finished) did you have on hand at the end of last year? \$ _____.
8. Which best describes the use of Value Stream Mapping at this facility? (Select one)
- **0:** None
 - **1:** A few isolated VSM events with outside assistance
 - **2:** A few isolated VSM events; Self-led
 - **3:** Regular VSM events; Self-led
 - **4:** Extensive VSM events; Self-led

9. Which best describes your company's awareness of your Local MEP prior to this Accelerate project? (Select one)
- **0:** None
 - **1:** Distantly aware, but no recent project work
 - **2:** Some past MEP involvement; but no recent direct project work
 - **3:** Recent direct project work with the MEP; Less than \$10,000 of total contract value
 - **4:** Recent direct project work with the MEP; More than \$10,000 of total contract value.
10. Which best describes your company's current "sales vs. production capacity" situation? (Select one)
- **0:** We can make more than we can sell. We have too much excess capacity.
 - **2:** Our production capacity and sales are balanced.
 - **4:** We're able to sell more than we can produce. We're max-out and need more capacity.
11. As a whole, which best describes your company's current attitude towards Lean (strategic waste reduction/ performance improvement) initiatives? (Select one)
- **0:** Some resistance to lean. Some key players are not on board.
 - **1:** We're new to lean and willing to learn. No significant resistance to lean methodologies.
 - **2:** We've started with Lean and making some progress in isolated areas.
 - **3:** We're pretty Lean already. We use lean mainly to address recognized problems.
 - **4:** Lean is an embraced lifestyle. Widespread culture of systematic ongoing continuous improvement.
12. Over the past 3 years, on AVERAGE, have you had to change your sales prices (select one)? (Select one)
- **0:** On average, raised prices.
 - **1:** On average, have been able to hold the line on prices.
 - **2:** On average, have reduced prices somewhat - Less than 5%
 - **3:** On average, have reduced prices significantly - Between 5 and 10%
 - **4:** On average, have reduced prices a great deal - more than 10%

Appendix 3: Supplier Lean Self-Assessment

Note: You can download a copy of this Excel file from the [WMEP Web site](#).

Supply Chain Advantage

MANUFACTURING EXTENSION PARTNERSHIP

Instructions: Select one or two people to help and only rank your production operations in each of the (8) focus areas based on your perspective of the current production process. Use the following ranking scales:

0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0

A to

Company Name		Rater									
#	Lean Philosophy	Focus Area	Self-Rating	Self-Rating	Arg. Rating		1	2	3-10%	4-70%	5
			1	2							
1	Support Systems	Standardized Work	2.5	5	3.8		No written standard operating procedures exist, including templates, checklists, and so forth.	Written Standard operating procedures exist however they may not be consistently followed.	Written Standard operating procedures exist however they may not be consistently followed.	Written Standard operating procedures exist. They are generally followed and occasionally updated.	Written Standard operating procedures exist. They are consistently followed as well as reviewed and updated regularly.
2	JIDOKA	Quality/Mistake Proofing	0.5	0.5	0.5		Other people find problems we didn't know we had.	We see the problem, but have difficulty finding the cause or the solution.	We can identify the problem and understand who's responsible to address, but have difficulty sustaining the corrective action	Rapid resolution & addressing problems with sustainable corrective action, but sometimes we don't identify the root cause.	Rapid resolution & addressing root cause problem with sustainable corrective action.
3	People	Empowerment Work force for Continuous Improvements	3.5	2	3.8		Only perform tasks when asked directly. Improvement ideas not produced by employees. No initiative taken to incorporate solutions - solve problems.	Workers are greatly limited on what they are empowered to change. Majority of solutions are still localized "quick fixes". Limited use of problem solving tools by working as teams.	Work teams exist, but managers and their approvals are required for them to effect changes. Teams are formed to make improvements and/or identify root-causes utilizing a quality methodology for major problems only.	Training has been deployed on team-work structures, scope, etc. Some employees and teams currently working independently of management to solve problems & implement solutions.	Self-managed teams report to management. Teams measure, analyze, and address problems on their own. Management provides tools, resources needed. Teams implement & execute the solutions.
4	Leadership	Systematic Continuous Improvement Culture	2.5	3.5	3.0		Currently no formal, structured, managed approach to continuous improvement. Lean Methodologies only used in an ad hoc manner (if at all) and not widely recognized as relevant in this organization.	Management initiates and directs Lean improvements without a formally structured, company-wide, managed improvement approach. Lean methodologies are used selectively (toolbox approach) as directed by management.	Lean methodologies are used with management empowering substantive employee involvement. Lean tools are used selectively, without a formally structured, managed, company-wide approach.	Lean methodologies are embraced as a complimentary package by Management to form the basis of a formal, structured, company-wide culture of improvement. Management initiates and directs Lean improvement with some input from employees.	Lean methodologies are embraced as a complimentary package by Management to form the basis of a formal, structured, company-wide culture of improvement. Management empowers employees for substantial involvement in a structured improvement approach.
5	Support Systems	5S (sort, set in order, shine, standardize, sustain)	4.5	2.5	3.5		No system to attack dirt and clutter. No 5S program. Infrequent cleaning. No organization or standardization.	Removal of unnecessary items has been completed. There is a daily cleaning of work area.	Work areas and machine are clean and neat. There is minimum organization and storage. Only necessary items are present.	Point of use for all daily tools and gages. Organization and labeling. Some standardization of tools and gages.	All levels of 5S implemented. 5S practiced daily. Full visual controls. Excellent safety rating. Standardization of all tools and gages. Systems in place to maintain 5S.
6	Support Systems	Visual Management	2	2.5	3.3		There are no visual displays such as posted metrics, training, bulletin boards.	Visual displays exist, but are often not regularly updated or used effectively to take action.	Visual displays are well understood and track meaningful performance indicators. Trigger points that may require intervention are set for formal corrective actions.	Visual displays are implemented and maintained by workers and management. The displays are the primary tool for communication of current status, planning and evaluating performance.	Every aspect of the project schedule, work streams, operating status, plans, and meetings are displayed in the team area on large attractive formats designed by the team.
7	Support Systems	Inventory Management (WIP)	3.5	2.5	2		No metrics, no controls, very low turn (1 or 2). Obsolescence is high.	<<<>>>	A, B, C inventory identified, measured, and tracked. Inventory levels adequate to meet customer demands (on time shipping, etc.)	<<<>>>	Pull systems in place, inventory levels balanced to customer demand. High turns in inventory (15 to 20).
			Average Total		2.5						

Appendix 4: Data Collection Sheets for VSM

Manufacturing Data Sheet

Note: A [printer-friendly version of this data sheet](#) is available on the Web site.

Process Name:	Step #:
C/T =	min
C/O =	min
1st Pass Quality Yield% =	%
Machine Reliability % =	%
Transfer batch Size =	# Units
Distance to next Op =	# Feet
# Operators Required=	
Shifts available =	
Other:	



_____ # units of physical inventory for part (family)



Queue Box

_____ amount of available production time needed to finish ALL work presently at a station in a FIFO non-expedited disposition.

NOTES:

Triggers: How do I know when to begin the process step for this part?
How is this step linked with upstream and downstream operations?

1st Pass Quality Yield %: When there are defects or other problems, what are they?

DEFECTIVE MATERIAL DEEP DIVE		
a. % Material Scrapped=		%
b. % Material Requiring Rework=		%
c. Avg. Time required for Rework =		hrs

Flow Stoppers, Issues and "Points of Pain": What is stopping flow? What do you need that you don't have? What issues need to be solved?

DEFINITIONS:

C/T (Cycle time): How often is a part completed by a process (as observed)?

C/O (Change Over): How much time between the last good piece of the previous run until the first good piece of the new run?

1st Pass Quality Yield %: What percent of the time does the material and process work RIGHT the FIRST TIME in and through? (no defects in or out, nor rework required)

Machine Reliability %: What percent of the time do you go to use this machine and it works properly (vs. doesn't work properly or broken)?

Transfer batch Size: How many pieces must be produced before the first piece is transferred to the next operation

Office Data Sheet

Note: A [printer-friendly version of this data sheet](#) is available on the Web site.

Process Name:	Step #:
Touch Time =	min
Batch/Wait =	min
1st Time Perfect%=	%
Output=	
# Operators Required=	
Shifts available =	
Other:	



Typical amount of available work time from the completion of this step until the beginning of the next step in a normal, non-Expedited disposition

NOTES:

Triggers:

How do I know when to begin the process step? How is this step linked with the downstream and upstream steps?

When this step is complete, what happens next?

Flow Stoppers, Issues and "Points of Pain":

What can stop the flow? What information or resources do you need to do this step? Is it typically available? What could be improved?

DEFINITIONS:

Touch Time = How much time to complete the operation without interruption?

Batch Wait = Typically, how much time (additional to touch time) between the time you start this step until you complete this step considering job batching, interruptions and other duties?

1st Time Perfect In and Through = What percentage of the time do you have everything you need so that you are able to complete this operation correctly the First time?

(No rework, or mid-process delays due having to incomplete or innacurate information or materials)

Output = What is the output of this step?

Appendix 5: Critical Concepts from "It's About Time"

Extending the Accelerate Time-based Improvement Philosophy to the Entire Enterprise

Note: A [printer-friendly version of these critical concepts](#) is available on the Web site.

Critical concepts from the book *It's About Time*.

Summarized by:

Andy Hayner
Operations Manager
MEP Supply Chain Advantage
June 1, 2010

The MEP Accelerate process and the book by Rajan Suri, *It's About Time*, have a common goal: To introduce manufacturers to the competitive advantage of applying time-based thinking throughout the manufacturing enterprise. We recommend this book as a complementary resource to the Accelerate process for exposing manufacturing business leaders to the rationale and tactical approaches for applying time-based thinking as a comprehensive strategy. To promote your further investigation, we've created a brief summary of a few critical concepts presented in this book.

Critical Concept 1

Understand Enterprise-Wide Waste Driven by Long True Lead Times (MCT)

Reference: *It's About Time*, pg. 20

Manufacturing Critical-path (MCT) measures total true lead time and is defined as *the typical amount of calendar time from when a customer creates an order, through the critical-path, until the first piece of that order is received by the customer*. Waste driven by long MCTs include:

- Expediting of hot jobs or late orders requires systems, unplanned air freight, shop floor and office personnel to manage and execute the changes, even top-management time to negotiate priorities between multiple hot jobs
- Production meetings required to update priorities and change targets

- Overtime costs for trying to speed up late jobs
- Time spent by Sales, Planning, Scheduling, Purchasing, and other departments to develop forecasts and frequently update them
- WIP and finished goods holding costs and space usage
- Resources used to store and retrieve parts repeatedly during the long MCT, plus potential damage to parts due to repeated handling
- Obsolescence of parts made to forecast and stocked but not used
- Quality problems not detected until much later, resulting in large amounts of scrap and rework
- Time to deal with delivery date and quantity changes during the long MCT
- Order cancellations or loss of sales to competition
- Sales time devoted to expediting and to explaining delays to customers
- Investment in complex computer systems and organizational systems required to manage this dynamic environment
- Lost opportunities to gain market share by offering shorter lead times for current or new products

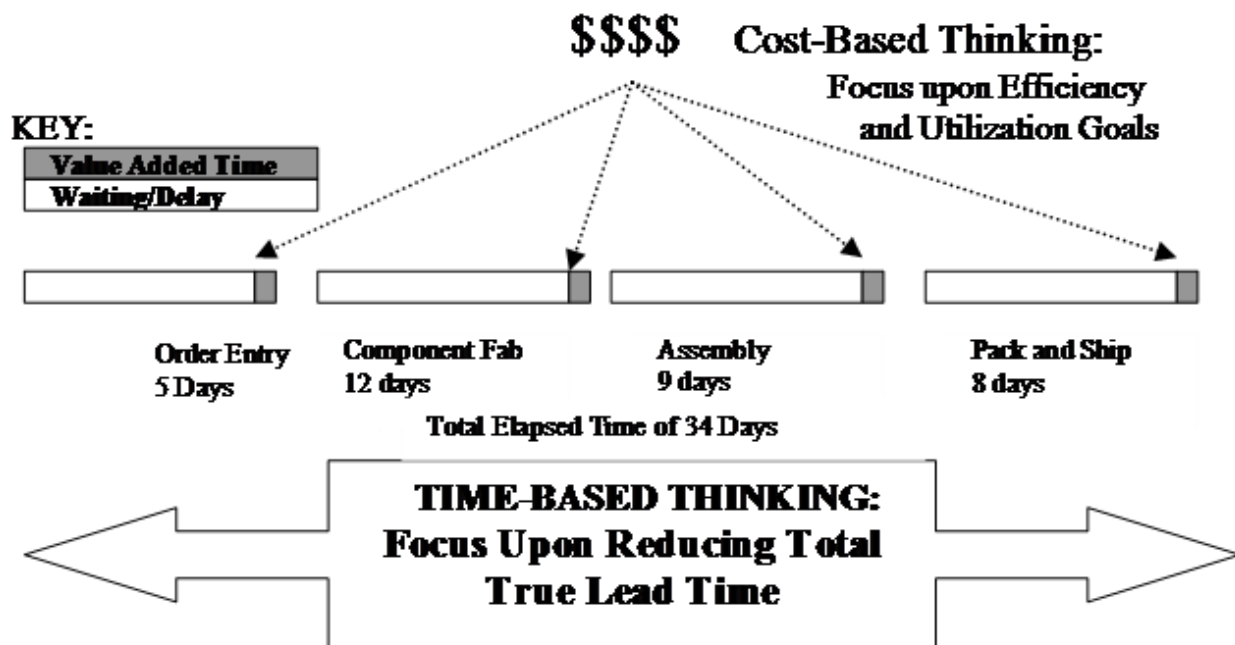
Critical Concept 2

Shift from Cost-Based Thinking to Time-Based Thinking

Reference: *It's About Time*, pgs. 21 & 22.

In most manufacturing companies, overhead is still allocated using fairly simplistic rules based on direct-labor or machine hours. Cost-based thinking attributes overhead costs to actual conversion costs. However, typically less than 5% of total lead time is value added time, and the rest is “white space” as in the figure below. Accounting systems do not identify the connection between the cost of the non-value added “white space” and specific products or activities, nor can it predict the impact of reducing total true lead time. Time-based thinking recognizes that overhead costs should not be attributed mainly to the value added or conversion cost but to the entire MCT.

In a typical US factory the total of all direct-labor cost is only around 10%. Thus optimizing this section of the operation might impact only this 10%. On the other hand, overhead can account for 40% or 50% of the cost of goods sold. Through a company-wide focus on MCT reduction and application of time-based thinking, you achieve a huge reduction in overhead activities and costs.



Critical Concept 3

Systems dynamic principles (rather than utilization rates) are the crucial consideration to deploy resources

Reference: *It's About Time*, pgs. 71 - 76.

- **\$8 million** Landing gear is used about 60 minutes out of a 4 hour flight for **25% utilization rate**. However, the landing gear utilization rate is irrelevant because it functions as part of an entire system (the air craft). In considering implementing cells, the correct question is not "What is the utilization of these machines," but rather, "What is the cost of this total system, and what is the return we expect to get from it?"
- As resources get busy, the waiting time increases. (e.g. Go to the supermarket on a weekday, you can checkout in 5 minutes. Go to the same store the day before Thanksgiving and it may take 30 minutes)
- Maximizing utilization drives up lead times which in turn increases costs (see [Critical Concept 1](#)).
- Strategically planning for spare capacity reduces overall costs and increases profitability. Planned loading of your resources should be kept under 85% of their capacity.
- Why do you need spare capacity? Why can't you operate at full utilization without any wasted resource? One word: variability. Most executives understand this but they don't

"Maximizing utilization ... increases costs."

understand the strong interplay between variability and utilization and the enormous resulting impact of both of these on MCT.

Principles to implement four structural changes to support time-based production are discussed on pgs. 47- 60.

These include:

- Quick Response Cells (co-located and dedicated resources for specific segments of production which can operate effectively in a “low volume, high-mix” environment)
- Team ownership of the processes within the cells
- Significant investment in cross-training
- Relentless focus on MCT reduction

Multiple tactics to reduce flow time are listed and discussed, pgs. 83-98.

The application of time-based thinking to the non-production segments of the enterprise, such as:

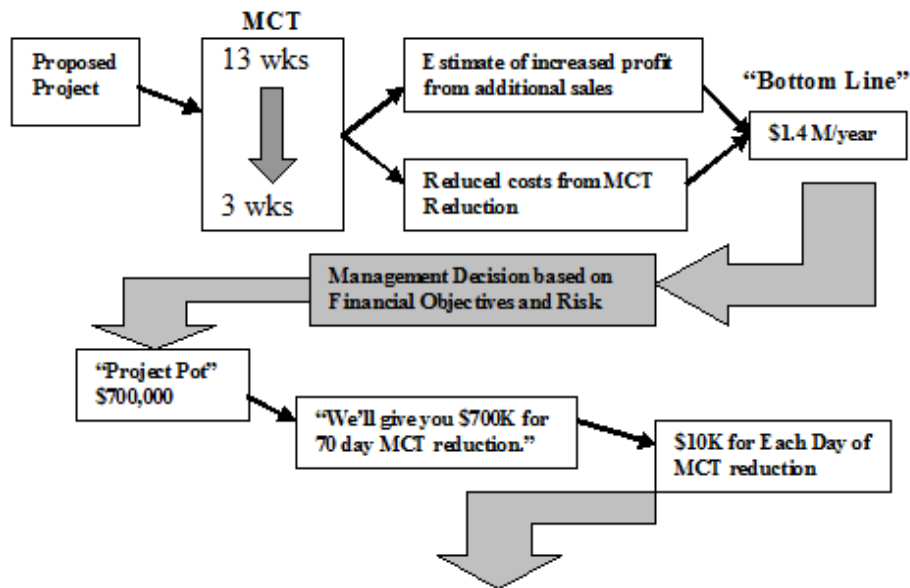
- Office Operations, pgs. 106-123
- Material Planning, pgs. 123-128
- Purchasing and Supply Management, pgs. 142-155
- New Product Introduction, pgs. 156- 161

Critical Concept 4

Accounting Strategies can be used to Support Time-based Thinking

Two models for Cost Justification for MCT reduction Projects:

- “Power of Six” Rule of Thumb, pgs. 165- 168 (see [Exhibit1](#))
- Value per Day of MCT, pgs. 173-180



The following accounting practices, described in detail on pages 180-190, are consistent with GAAP, yet strategically support Time-based thinking. These can be used independently, but have a synergistic effect when applied in combination.

- Use strategic overhead allocation.
 - Apply Lower overhead rates for cells by determining an allocation rate for each cell.
 - Create a strategic overhead pool to collect unabsorbed overhead
- Assign overhead using more than just direct labor.
 - Quantify some key processes that are required for jobs and cost those out directly
- Reassign some overhead costs specifically to large batches
 - This provides an incentive to run smaller batches. Now, if you want to run a batch of 500 when the customer needs 100, the extra 400 will get allocated the additional burden.
- Apply overhead at the time of shipping
 - to promote production to customer demand and penalize overproduction.
- Apply overhead based on MCT
 - An alternative would be to apply overhead based on the time that a work order is open, or other similar measures with a clear connection to MCT.

Critical Concept 4, Exhibit 1


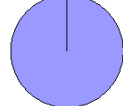
Cost Impact of MCT Reduction Chart

The “Power of Six” rule developed from academic research provides a rule of thumb cost impact estimation for MCT reduction. The chart below is developed from this formula. Percent of MCT reduction is correlated with the expected corresponding cost reduction based on this formula.

MCT Reduction	Cost Reduction	MCT Reduction	Cost Reduction	MCT Reduction	Cost Reduction
1%	0.2%	34%	6.7%	67%	16.9%
2%	0.3%	35%	6.9%	68%	17.3%
3%	0.5%	36%	7.2%	69%	17.8%
4%	0.7%	37%	7.4%	70%	18.2%
5%	0.9%	38%	7.7%	71%	18.7%
6%	1.0%	39%	7.9%	72%	19.2%
7%	1.2%	40%	8.2%	73%	19.6%
8%	1.4%	41%	8.4%	74%	20.1%
9%	1.6%	42%	8.7%	75%	20.7%
10%	1.7%	43%	9.0%	76%	21.2%
11%	1.9%	44%	9.2%	77%	21.8%
12%	2.1%	45%	9.5%	78%	22.3%
13%	2.3%	46%	9.8%	79%	22.9%
14%	2.5%	47%	10.1%	80%	23.6%
15%	2.7%	48%	10.3%	81%	24.2%
16%	2.9%	49%	10.6%	82%	24.9%
17%	3.1%	50%	10.9%	83%	25.6%
18%	3.3%	51%	11.2%	84%	26.4%
19%	3.5%	52%	11.5%	85%	27.2%
20%	3.7%	53%	11.8%	86%	28.0%
21%	3.9%	54%	12.2%	87%	28.9%
22%	4.1%	55%	12.5%	88%	29.8%
23%	4.3%	56%	12.8%	89%	30.8%
24%	4.5%	57%	13.1%	90%	31.9%
25%	4.7%	58%	13.5%	91%	33.1%
26%	4.9%	59%	13.8%	92%	34.4%
27%	5.1%	60%	14.2%	93%	35.9%
28%	5.3%	61%	14.6%	94%	37.5%
29%	5.6%	62%	14.9%	95%	39.4%
30%	5.8%	63%	15.3%	96%	41.6%
31%	6.0%	64%	15.7%	97%	44.3%
32%	6.2%	65%	16.1%	98%	48.0%
33%	6.5%	66%	16.5%	99%	53.7%

Appendix 6: Sample Completed Project Plan

Sample Completed Project Plan

COMPANY: Acme Stamping		VSM PROJECT PLAN					Date: 6/15/2008		<div>Classification</div> <div><div><div>■ 1 = Internal Resources</div><div>■ 3 = 3rd Party Resources Needed</div><div>■ 0 = OEM Help Necessary</div></div></div> <div>Percent Complete</div> <div><div>0%</div></div>			
		Status		Classification		Count	Percent					
		O = Open 11		1 = Internal Resources		2	18.2%					
		C = Closed 0		3 = 3rd Party Resources Needed		5	45.5%					
		P = Partial 0		0 = OEM Help Necessary		4	36.4%					
		Total 11										
		Complete 0%				Total 11						
VSM Loop	ID	Status	Classification	Priority	Dept	Description	Target Completion Date	Actual Completion Date	Assigned to (Primary)	Assigned to (Other)	Impact/Goal	Comments
	Qts Plan	1	O	0	3	Provide feedback to OEM on incorrect pricing	10/24/2008		Don	Boat	Reduce pricing errors	Waiting for Buyer transition
	Qts Plan	2	O	0	4	Provide quote with cost and list price	10/24/2008		Don	Boat	Reduce pricing errors	
	Qts Plan	3	O	0	1	OEM to convert BOM	10/17/2008		Art	Don	Reduce LT	Just from OEM required
	Qts Plan	4	O	0	1	Get colors from up front from Snap On, at time of order receipt	10/24/2008		Joyce	But	Reduce QT	Peter R from OEM required
	Qts Plan	5	O	1	1	Provide better notification to OEM of missing images	10/24/2008		Liz	Art	Reduce QT	
	Raw	7	O	1	1	Establish Raw Material Supermarket	10/25/2008		John	Bernice	Reduce LT	
	Raw	8	O	3	2	Implement Kanban Replenishment system with Raw Material Supplier	10/26/2008		John	Bernice	Reduce LT	Work with Matsun at ABC Supply
	Qts Mfg	9	O	3	1	Layout Weld/Assy Cell	10/17/2008		Don	Mike	Reduce DT	
	Qts Mfg	10	O	3	2	Cross train Workers	10/24/2008		Gabe	Mike	Increase Eff	
	Qts Mfg	11	O	3	1	Establish Finished Goods Supermarket with Kanban	10/17/2008		Don	Mike	Reduce DT	
	Qts Mfg	12	O	3	2	Establish Supermarket after Stamping with Kanban	10/24/2008		Jack	Gabe	Increase Eff	
		13										
		14										

Appendix 7: Supplier Project Report Template

Note: A [printer-friendly version of these slides](#) is available on the Web site.



Report Template Slides 1 and 2



Report Template Slides 3 and 4


Accelerate Charter Highlights

- Project Scope: Part or Part Family selected for mapping activities
- Business Case:
 - Overall volume of Business between Supplier and OEM
 - Volume of business represented in Value Stream selected for Accelerate project

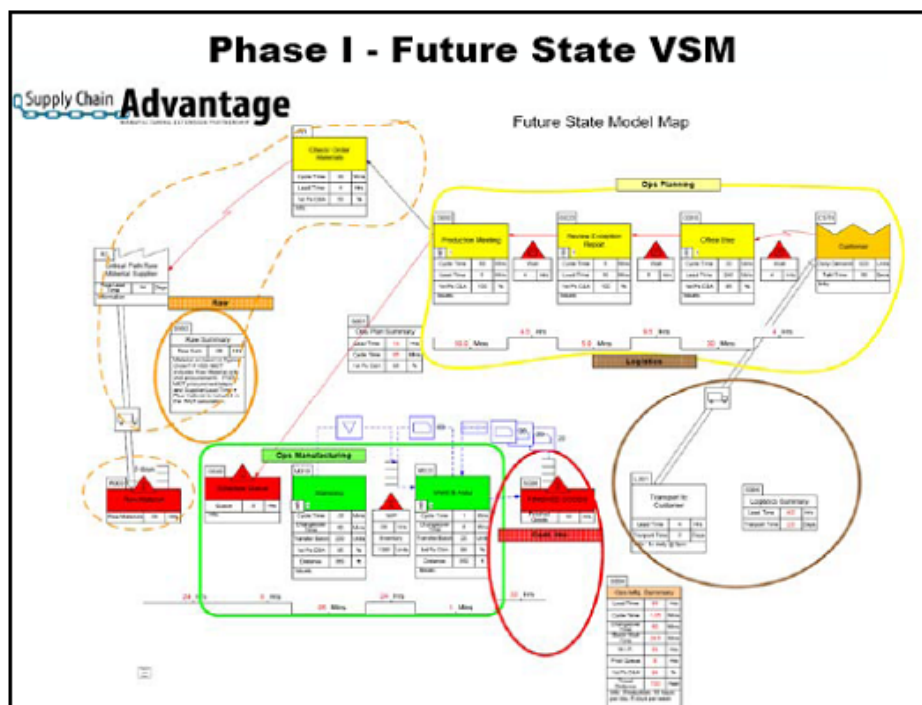
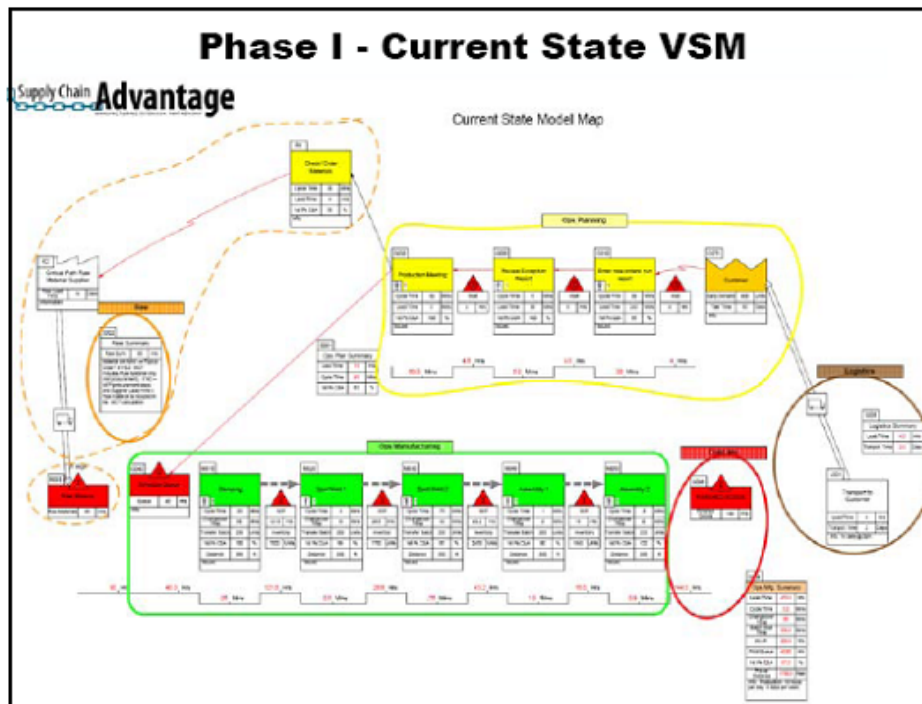


Project Team Members

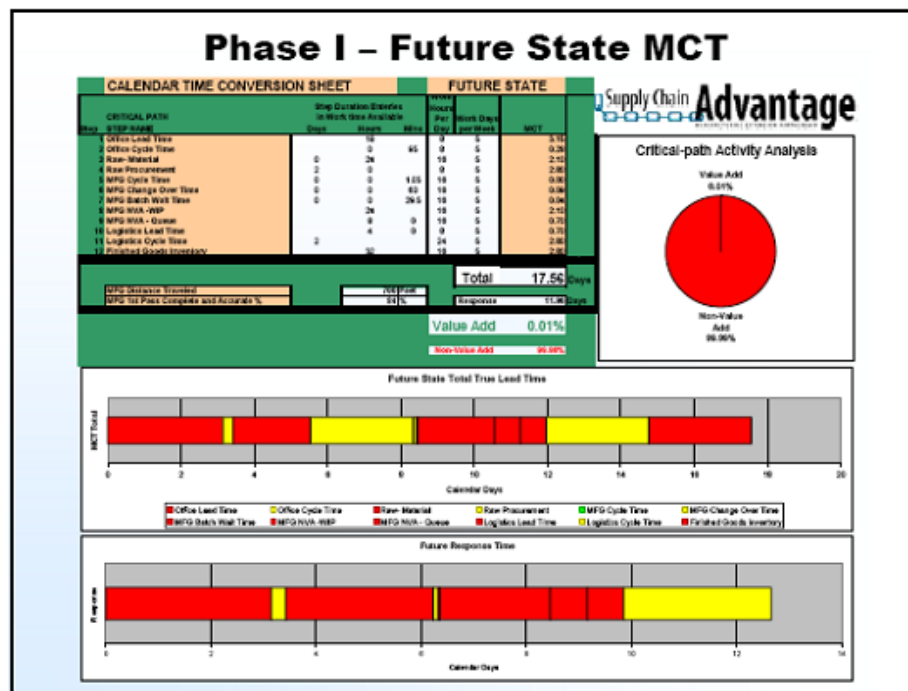
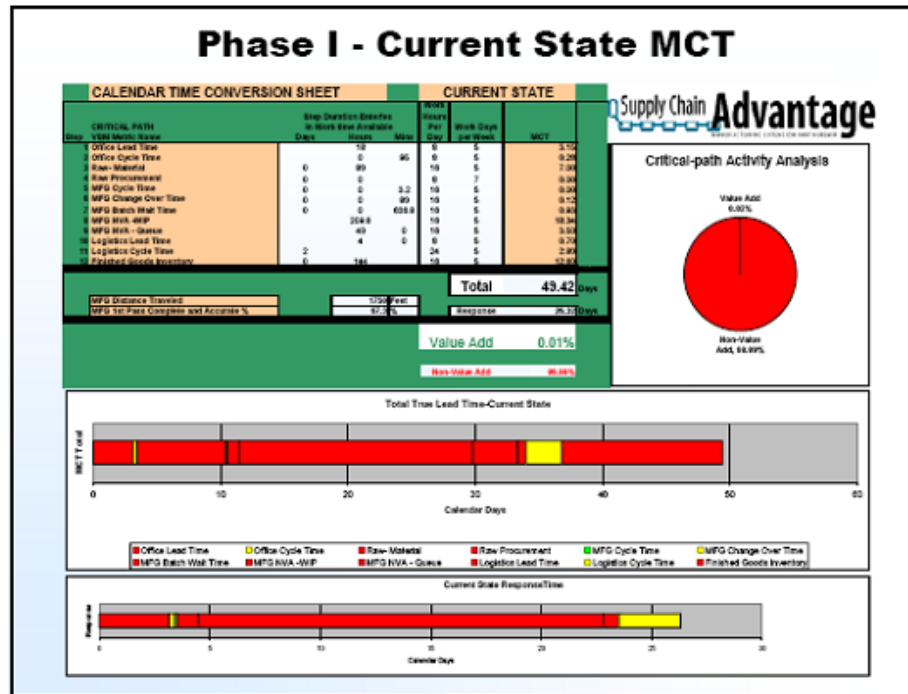
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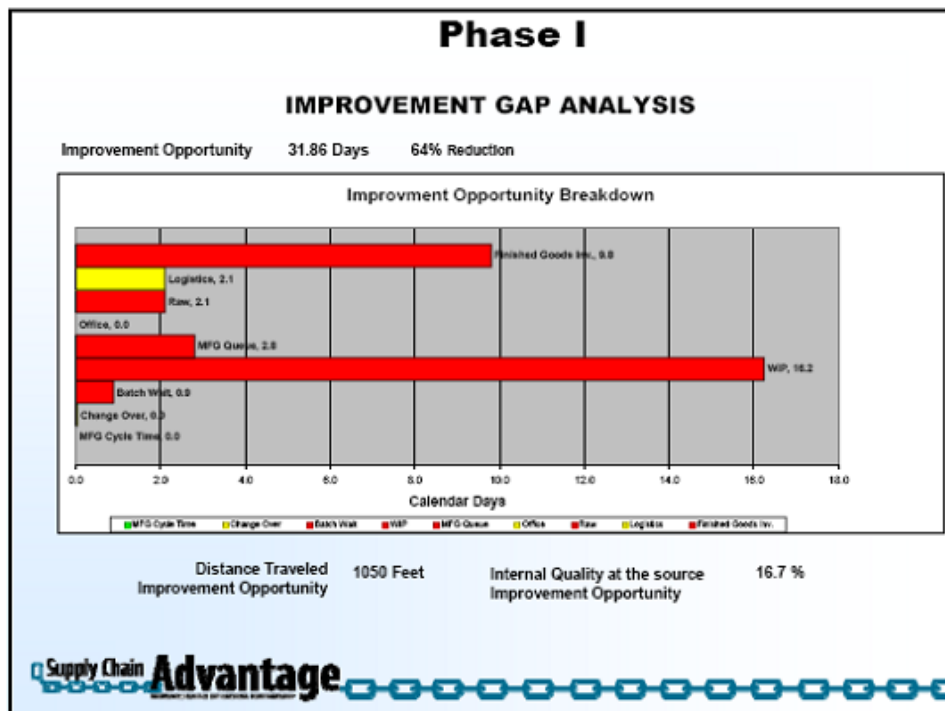
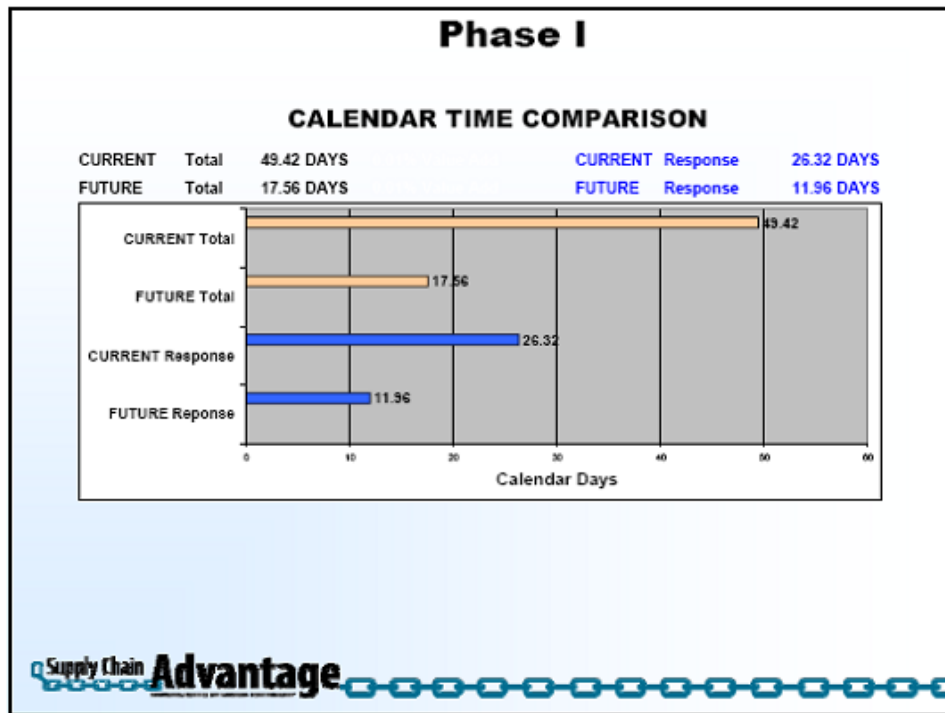
Report Template Slides 5 and 6



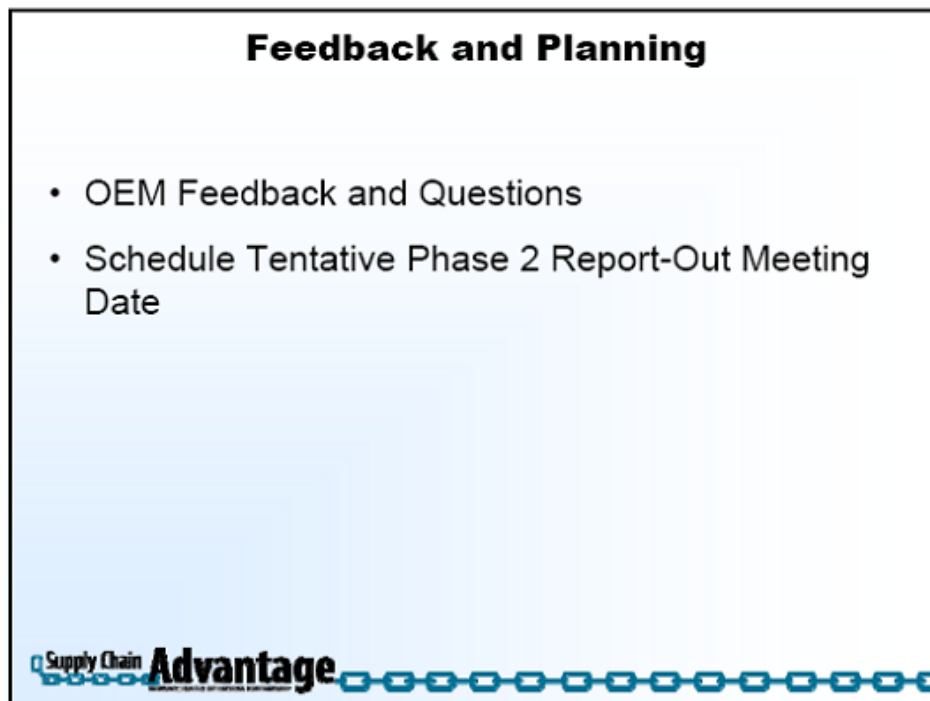
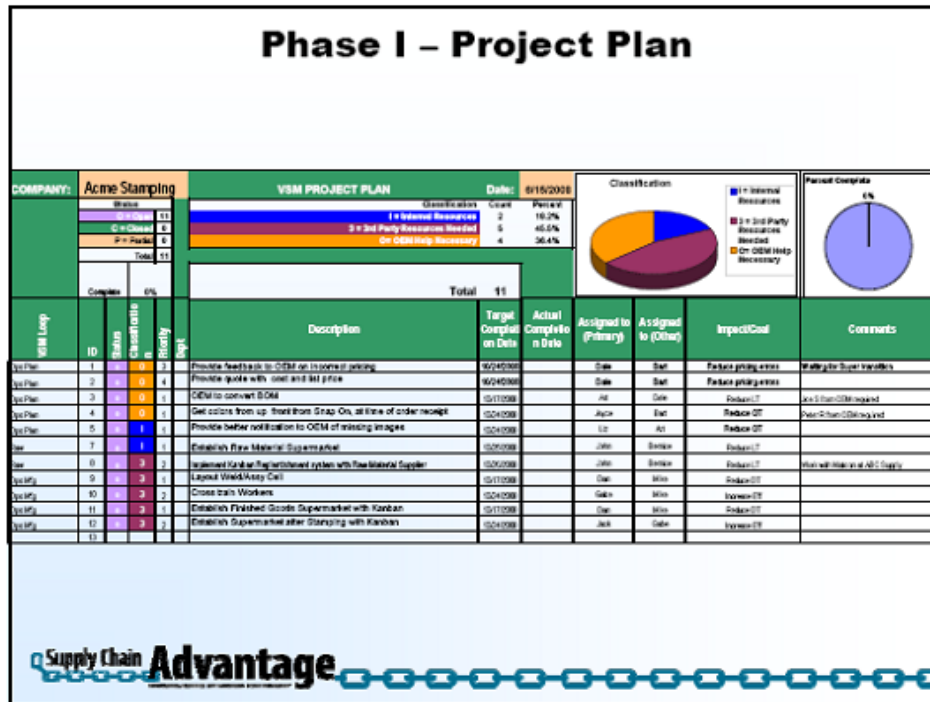
Report Template Slides 7 and 8



Report Template Slides 9 and 10



Report Template Slides 11 and 12




Report Template Slides 13 and 14

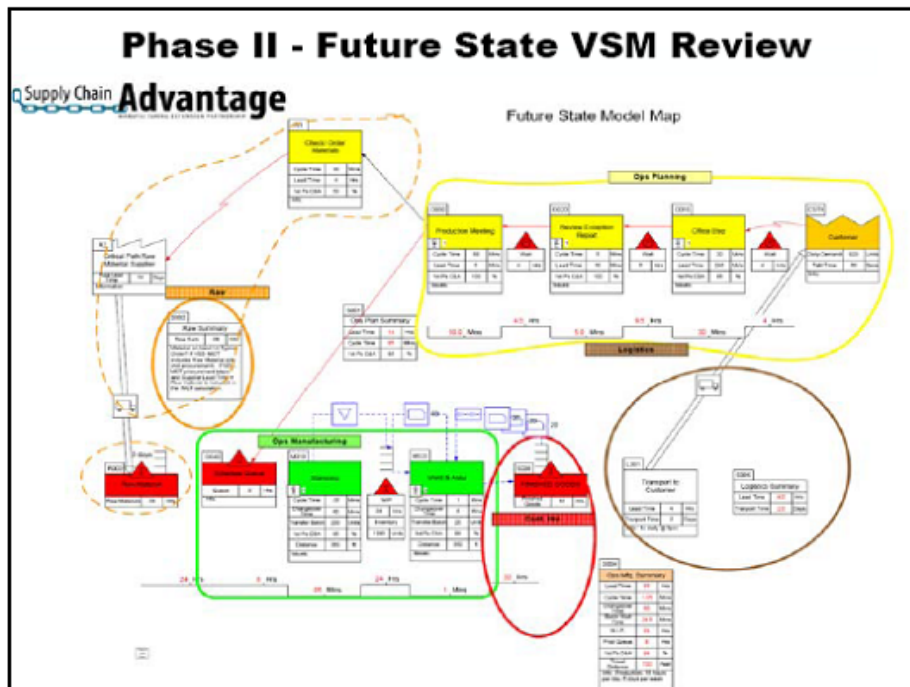


**Phase II
Accelerate Charter Highlights Review**

- Project Scope: Part or Part Family selected for mapping activities
- Business Case:
 - Overall volume of Business between Supplier and OEM
 - Volume of business represented in Value Stream selected for Accelerate project



Report Template Slides 15 and 16



Phase II

Implemented Improvements Overview

High-level Completed Project List

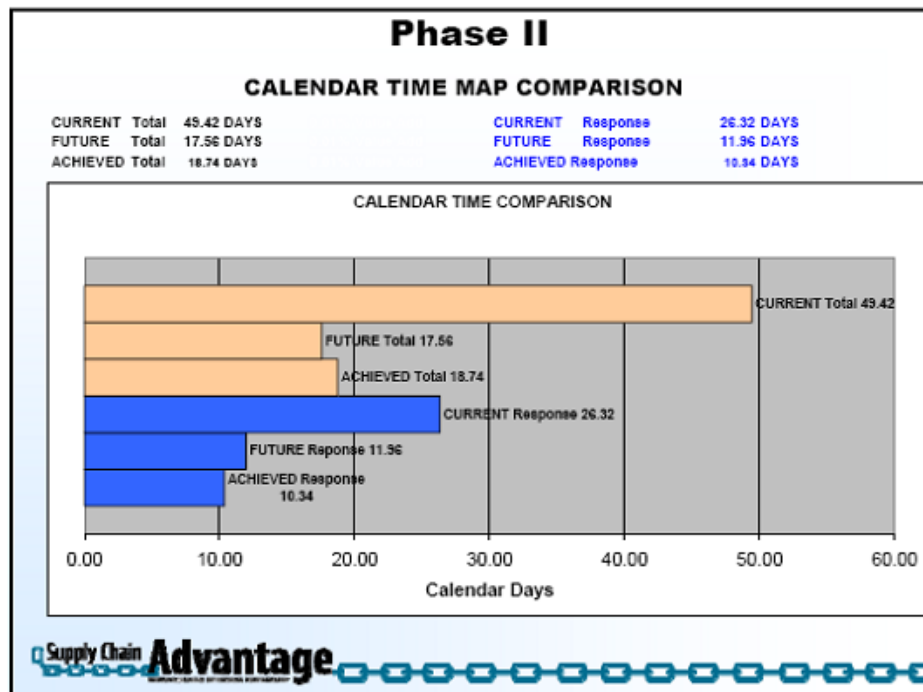
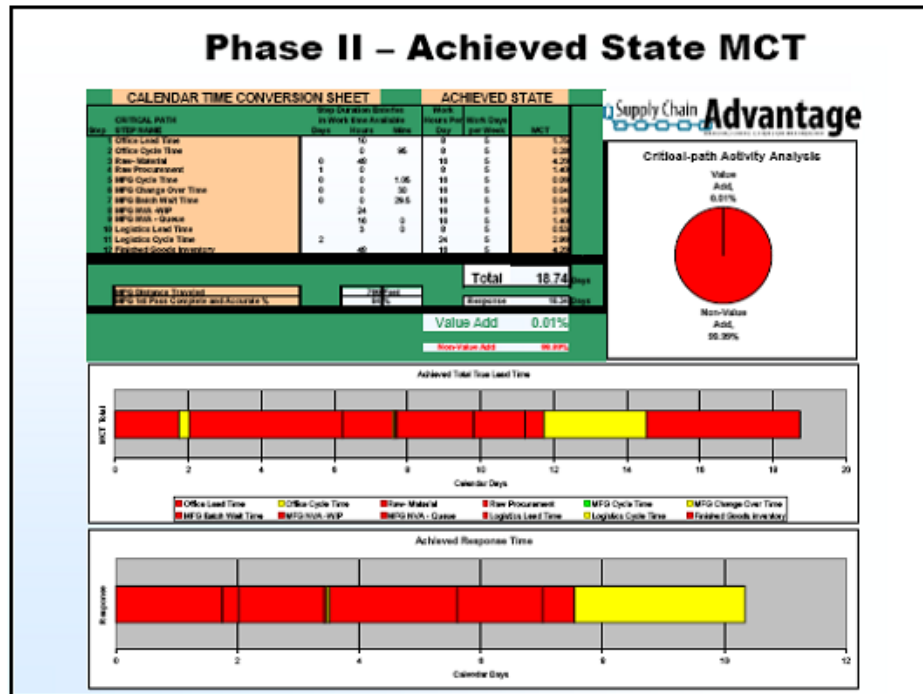
Completed Project 1

Completed Project 2

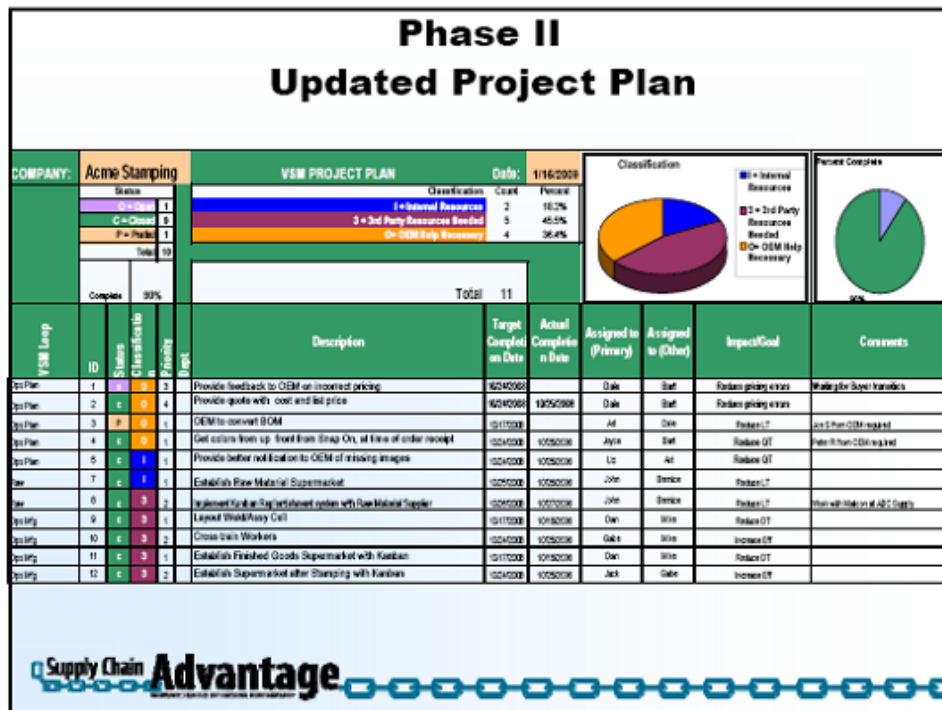
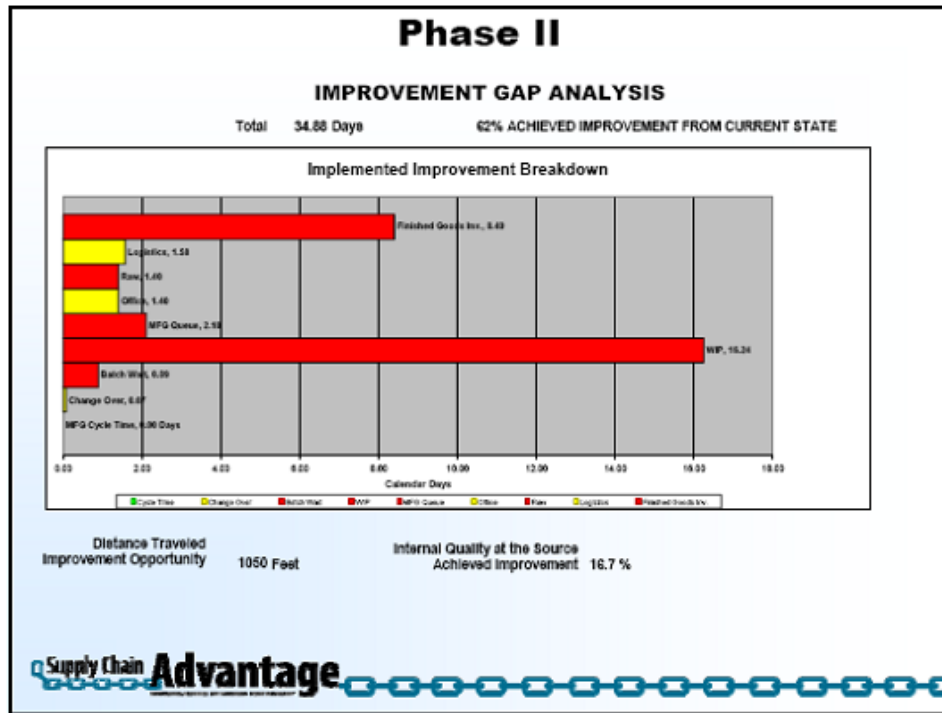
Completed Project 3

Completed Project 4

Report Template Slides 17 and 18



Report Template Slides 19 and 20



Report Template Slides 21 and 22

“Next Steps”

1 Year Continuous Improvement Plan


- Target Improvement Areas:
- Leadership Assigned:
- Additional Resources:
- Expected Outcomes:
- Timeline:

 Supply Chain Advantage

Phase II

Supplier Project Evaluation

- Lessons Learned:
- Benefits:
- Open Issues:
- Additional Feedback:

 Supply Chain Advantage

Appendix 8: Post Phase I Review Questionnaire

Note: A [printer-friendly version of this questionnaire](#) is available on the Web site.



M.E.P.: _____ **Supplier:** _____ **Project** _____
Dates: _____
MEP Project Lead: _____ **Email:** _____
MEP Project 2nd: _____ **Email:** _____

Following the Accelerate Phase I project, the Supply Chain Advantage office requests that the MEP delivery staff complete the following questionnaire. The answers given are MEP confidential for Accelerate program assessment and management purposes only.

1. How would you assess the Suppliers attitude towards lean implementations?
 - a. Enthusiastic Experts
 - b. We're Lean Already
 - c. Progressing in Some Areas
 - d. New and Willing to Learn
 - e. Some Key Resistance

Comments: _____

2. How would you assess the lean improvement opportunities that exist overall at this Supplier?
 - a. Huge
 - b. Substantial
 - c. Moderate
 - d. Small
 - e. Very Little

Comments: _____

3. How likely is the Supplier to apply these lean tools and strategies to other areas their business?

- a. Very Likely
- b. Likely
- c. Moderate
- d. Unlikely
- e. When Pigs Fly

Comments:

4. How likely is this Supplier to contract with your MEP for future work?

- a. Contract Already Signed
- b. Contract Requested
- c. Likely
- d. Possible
- e. Unlikely

Comments:

5. How would you assess the contribution of this Accelerate engagement towards the Supplier's progress in understanding and implementing lean methodologies in their business?

- a. Extremely Helpful
- b. Helpful
- c. Somewhat Helpful
- d. Not Much Help
- e. Detracted From Progress

Comments:

6. How would you assess the benefit of this Accelerate project in your Local MEP establishing/developing a relationship with this Supplier customer?

- a. Extremely Helpful
- b. Helpful
- c. Somewhat Helpful
- d. Not Much Help
- e. Detracted From Progress

Comments:

Appendix 9: Prelim Supplier Project Financial Impact

Note: You can download a copy of this Excel file from the [WMEP Web site](#).

Supply Chain Advantage MANUFACTURING EXTENSION PARTNERSHIP		Project Part Family Focus:		Part Family Impact:				
Date:	Company Name: Company Representative:							
Red=Primary Financial Impact Black=Performance Impact/Secondary Financial Impact								
IMPROVEMENT CATEGORIES	STANDARD IMPROVEMENT DATA - Required	Baseline	Unit	Baseline \$	Achieved	Unit	Achieved \$	\$ Savings
	MCT Total	100	Calendar Days		50	Calendar Days		
	Productivity	100	Units per hour		125	Units per hour		
	Inventory Turns	12	Turns Per Year		24	Turns per year		
	Capacity Opportunity						\$180,000	
INVENTORY	Finished Goods on Hand	2000	Pieces	\$30,000	1000	Pieces	\$15,000	\$ 15,000
	WIP	5000	Pieces	\$50,000	2500	Pieces	\$25,000	\$ 25,000
	Raw material Inventory	7000	Pieces	\$35,000	500	Pieces	\$2,500	\$ 32,500
	Inventory Carrying Costs Factor	10	%					
	Additional Value Stream Inventory Reduction	20	%				\$20,000	\$ 20,000
						Inventory Savings		
						SUB-TOTAL		\$ 101,750
General Improvements	Production Fallout/WIP Scrap/Defect/Yield	5	%	\$2,500	2	%	\$1,000	\$1,500
	Rework Costs	\$500	per month	\$5,000	\$250	per month	\$3,000	\$3,000
	Change Over Labor Requirements	20	hrs per run	\$4,800	12.5	hrs per run	\$3,000	\$1,800
	Direct Labor	50	hrs per run	\$12,000	34	hrs per run	\$8,400	\$3,600
	other (paste from lean savings list on page 2)							\$0
other (paste from lean savings list on page 2)								\$0
other (paste from lean savings list on page 2)								\$0
						Improvement Savings		
						SUB-TOTAL		\$ 10,140
POST-PROJECT IMPACT SURVEY		TOTAL				Total Gross Project Savings		\$ 111,890
Project Cost Savings (Total from Worksheet Above)		\$ 91,890				Project Execution Cost		\$ (20,000.00)
Capital Investments						Total Net Project Savings		\$ 91,890
Avoided Unnecessary Investments								
Retained Sales								
Increased Sales		\$ 100,000						
Investment In Workforce Practices or Employee Skills								
Investment in systems, software, or technology								
Retained Jobs as result of project								
Increased Jobs as result of project								
Would you recommend us to a non-competitor(scale 1-10)?								
OEM COLLABORATION BENEFIT								
Approximately how much of the project impact realized above required OEM collaboration for successful execution?								