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Lean Series - Value Stream Analysis

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Introduction:

Value Stream Analysis is the basic building block for creating an effective lean implementation plan. Value Stream Analysis (VSA) can be viewed as the roadmap and the navigation updates for your lean journey. The future state map and the action plan effectively serve as the directions for the journey. Just like on any journey where you periodically look at your roadmap to stay on course--you will periodically conduct a new VSA to assess what you have achieved, what should be the next improvements and how will these improvements will be achieved. A new value stream map (VSM) and an action plan are generated each time you complete a VSA.

The VSA process is *the simple process of directly observing the flows of information and materials as they now occur, summarizing them visually, then envisioning a future state with much better performance*.[1] The improvement activity centers around the improvement of Value Streams with a value stream being defined as *the set of all the specific actions required to bring a specific product ...raw material to a finished product in the hands of the customer*.[2] The elements of a value stream have a defined start and stop, but can contain other value streams within it as well as be part of a larger Enterprise Value Stream. A VSA lets you to develop a system level view of the waste in the value stream and to stop looking at aggregated activities and isolated machines.[3]

The VSA process requires preparation and planning to insure that people and data are available. When done properly, the VSA results in a sequenced list of activities to help you reach your goals and objectives.

The process follows a simple sequence aimed at first highlighting waste, then brainstorming improvement, followed by documentation of the plan. The steps of a VSA are: documenting a Current State Map, identifying the Ideal State Map, creating the Future State Map, and creating the prioritized Action Plan.

Once the VSA is completed then the real work begins. Many people who are new to the lean journey think the output of the VSA is the future state map. In reality, the real output of a VSA is the action plan. A prioritized action plan helps you schedule and resource the activities required to transform the current state to the future state.

History:

Value stream analysis was developed by Toyota as a tool for addressing material and information flows. (Toyota refers to the tool as 'Material and Information Flow Mapping')[4] For many people outside of Toyota, the book ***Lean Thinking*** by Jim Womack and Daniel Jones was the first time that they heard about the tool and its power. Mike Rother and John Shook later explained how to conduct a VSA in there workbook—***Learning to See.***

While Toyota used the original analysis to analyze material and information flow, VSAs have expanded to include quality and uptime which make VSAs an even more powerful diagnostic tool for improving value streams. Additionally, the focus of VSAs has expanded beyond simply the factory to include more in-depth analysis of internal

administrative functions and the supply chain (both suppliers and customers). The expanded view of all of value creating activities is known as the lean enterprise.[5]

Process Steps:

Preparation

As the saying goes, preparation is half the battle. Successful VSAs start with good preparation. The preparation step consists of 4 activities:

1. Selecting the team
2. Arranging logistics
3. Identifying the boundaries of the VSA and the areas of focus
4. Collecting the data necessary to support the event

First, a VSA cannot be conducted by 1 or 2 individuals. The creation of a future state plan cannot be simply delegated to an outside consultant or internal lean experts.[6] A VSA must be completed by a team comprised of the Value Stream stakeholders to ensure that an accurate view of the value creation process is developed and a realistic future state action plan is created. The event should be led by the value stream leader (VSL) since they are responsible for the execution of the plan. Once the team has been selected, then the team can work together to complete the other elements of preparation.

As part of the prep work for a VSA, the team needs to define the product to be mapped and the boundaries for mapping. While is possible to map all the products or services offered, these maps can get confusing and hard to understand. Therefore, pick one item or a family of like items to map. Once you know what you want to map, then you can determine the boundaries of the map. Typically, in the initial VSA's the boundaries are from the supplier deliveries of the main raw material to the delivery of the

finished product to the customer. These boundaries may expand as the value stream matures to include the sales process and supplier development (essentially moving upstream and downstream in the value chain).

Finally, the team should agree on the goals of the event and coordinate these goals with their management teams. They can then collect the supporting data to complete the preparation step.

Current State Map

The current state map, as the name implies, is a picture of your current situation—material and information flow, customer requirements, and supplier management process. The map starts with the customer box on the right side of the page and the major raw material supplier on the left side of the page. The information flows across the top of the page and the conversion process across the bottom.

Typically the maps are hand drawn with multi-color Postits using the templates shown in Figure 1. The process of drawing a current state map begins by walking the process backwards and collecting data on the process steps using a form similar to the data box example in Figure 1. Walking the process backward changes your perspective on the process and allows the team to see the view of the product's receiving customer as it flows through the value stream. Once the walk is complete, then post the information on a wall using the postits (to draw the process) and the data collection sheets (for the data boxes). Figure 2 shows an example current state map.

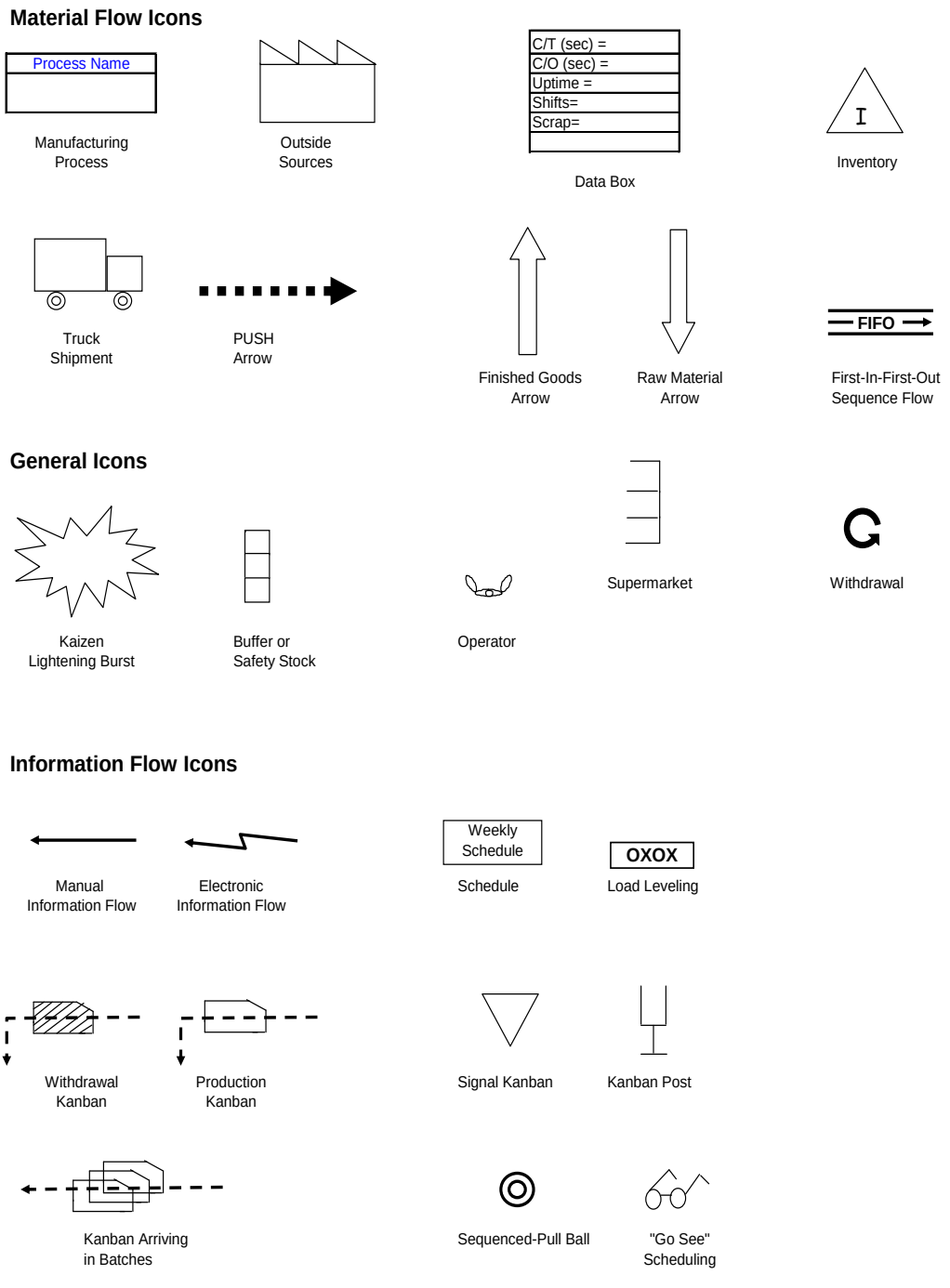

Figure 1 – Basic Value Stream Mapping Icons

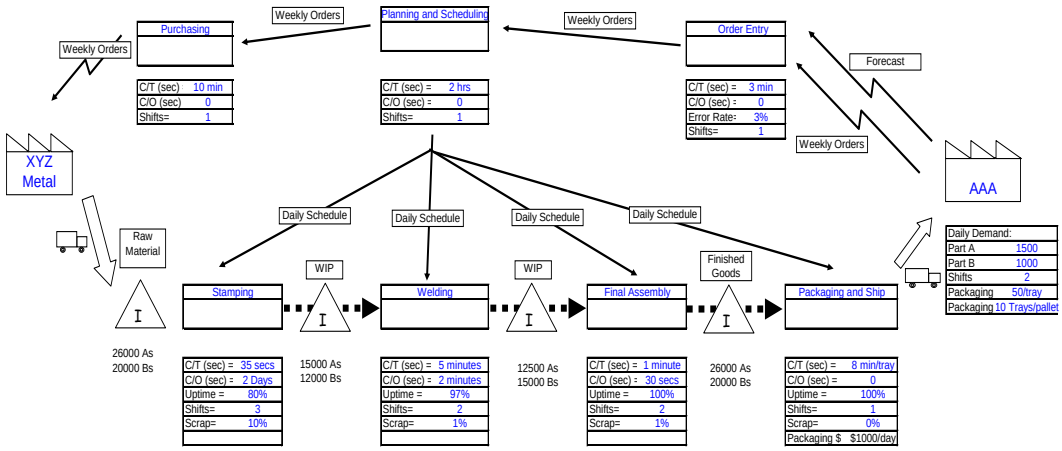

Figure 2 – Current State Map Example

Once you have the current state map completed, then create a lead-time ladder to summarize the waiting and inventory in the process. The lead time ladder pictorially highlights the waste and the opportunity associated with product stops and inventory storage at each step in the map. It also shows how attacking inventory (raw material, work in process, or finished goods) will reduce lead-time and ultimately costs.

Ideal State Map

The next step in a VSA is the generation of the ideal state for the process. More precisely, the ideal state map shows what would be the least waste, fastest flow possible for the value stream in the next 3 -5 years if you were unconstrained by resources. In this phase of the analysis, you and your team are shifting gears to look forward. It is from the forward looking reference point of the ideal state that you will want to build a future state map. It is only by looking forward in a VSA that breakthrough improvement occurs vs. just improving the current state. Therefore, the ideal state serves as a destination and the current state map is simply the starting point of the journey to the ideal state. Figure 3 shows an example of an ideal state map.

To construct the ideal state, think in terms of the future based on your knowledge of what is value added and what is waste. The team should ask these questions as they create the ideal state:

- How would you manufacture the product with the quickest flow, least steps, and least inventory?
- How would you ship the product to the customer?
- How would you simplify the ordering and delivery process for your customers?
- How would you simplify how your suppliers send material to you?
- How would your suppliers bill you and how would you bill your customer?

Now describe these characteristics with a list of words and a simplified process flow.

While the ideal state exercise sounds like a daunting exercise, it isn't if a few simple rules are followed:

1. Limit the time to 1 hour
2. Keep the flow at a very top level--do not get trapped into making a detailed process map.
3. Remember that this is an exercise of what is possible without resource constraints.
    - Wait until the end of the exercise to look at what the obstacles are to achieving the Ideal State and how much control you have over them.
    - Use a little common sense—the ideal state cannot be achieve if it requires discovering another law of quantum physics.

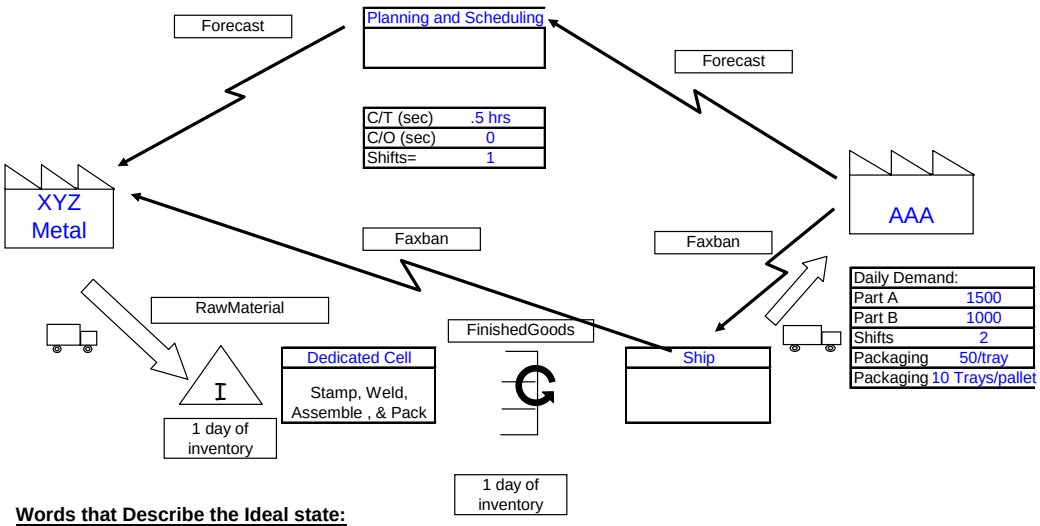

Figure 3 – Ideal State Map Example

Future State Map

In the future state map we define our improvement actions for the next 6 months to a year. We chose the Value Stream's destination when we created the ideal state and we determined our present condition when we created the current state map. The future state map becomes the linkage between both states by serving as a visual depiction of the next steps in the Value Stream's lean journey.

By drawing the future state map, the team is answering two fundamental questions:

1. What in the current state must change to achieve the ideal state (and the goals created during the prep phase).
2. Which of the potential changes has the highest impact?

Many potential answers exist to these questions depending on the value stream's current and ideal states. However, typical activities are: combining process steps into administrative and manufacturing flow cells, establishing pull scheduling, customer and supplier kanbans, quality improvement events, quick changeover events, and total productive maintenance events.

As you select these activities follow a simple process:

- Document the actions required to achieve the change with a kaizen burst (Shown in Figure 1.)
- Redraw the map flow caused by the change
- Estimate the improvement and update the data collection boxes.

By following this process, your map will come to look like Figure 4.

Typically, the number of activities suggested will exceed the capacity of the team which requires resolution before calling the future state map complete. Remember this words for Jeffery Liker and David Meier's book, *The Toyota Way Fieldbook: "*Don't outrun you headlights in planning events."[7]

The capacity issue can be resolved by discussion or by using team consensus tools such as an impact vs. effort matrix. (The impact vs. reward matrix ranks ideas by impact and effort which helps the team ideally select actions based on highest impact and least effort.) When the final activities are selected and the lead-time ladder is updated, then the Future State Map is complete.

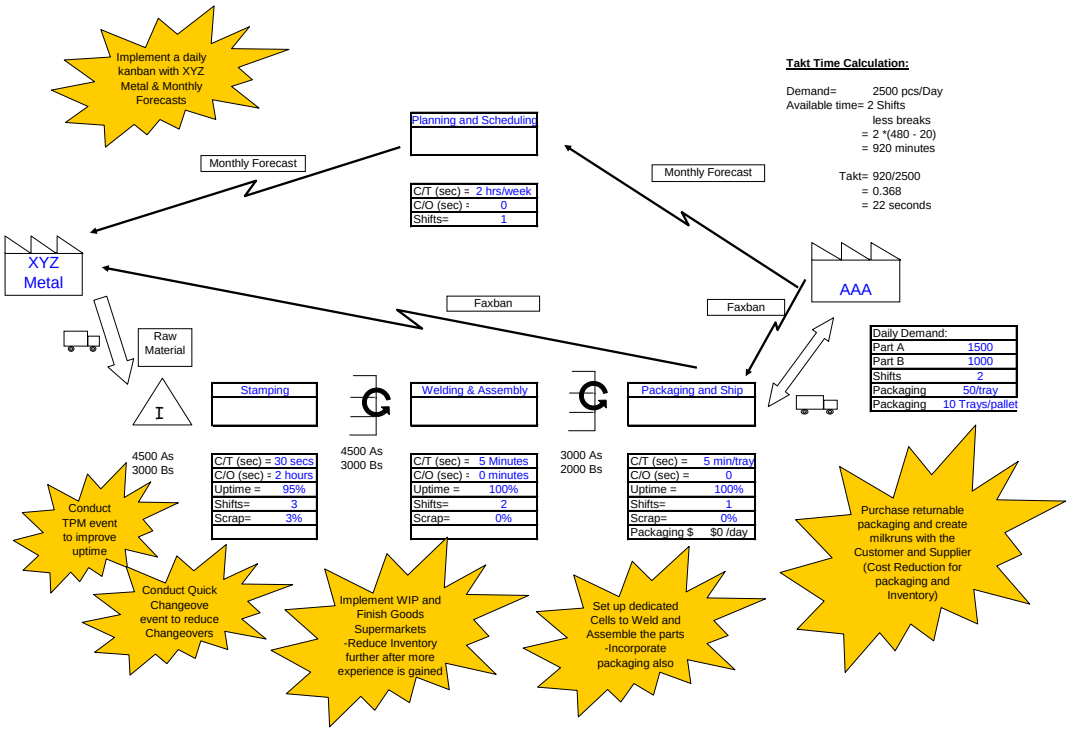

Figure 4 – Future State Map Example

Action Plan

In a VSA, the future state map is not the final product. The action plan is the real deliverable of the VSA. It shows how the selected improvements in the future state map will be phased, who will lead them and who will participate on the implementation team for each of the selected improvements. The action plan also ensures that the selected plan is achievable and that the team is not overloaded. (Remember, these folks also have other responsibilities.) Considerations for the plan should include:

- Are the high impact activities completed first?
- Is the sequence of activities correct?

- Does the plan consider other outside changes—seasonal business, new product launches, arrival of new equipment, etc?
- Is everyone participating?

The action plan should cover the value stream team's lean implementation plans for the next 6 to 12 months. Improvements that cannot be completed in this window due to capacity should be tracked for consideration in future VSAs.

Post VSA:

Once the VSA is complete--the real work begins. It is now time to execute the plan. The first step of execution should be coordination of the plan with everyone impacted by it:

- Share the future state map and the action plan with everyone.
- Post them and answer questions so that everyone knows the value stream's improvement plans.

The goal of the value stream team should be to complete the action plan: essentially the future state map becomes the current state map for the next VSA. Therefore, tracking and updating the progress of the action plan should become an integral part of the team's operating system.

The last step in implementing the future state action plan is to schedule the next VSA.

Summary:

Value Stream Analysis creates the roadmap for your lean journey. The three maps created in the analysis process are intended to pictorially communicate the current state, the ideal state and the future state. The future state map then becomes the basis for

creating a phased, prioritized action plan that guides the value stream team on their lean journey for next 6 to 12 months. Many people mistake the future state map as the deliverable for the VSA--the action plan is the true deliverable for a VSA. The action plan is the execution plan for achieving your future state.

Acronym List:

C/O – Changeover

C/T – Cycle Time

VSA – Value Stream Analysis

VSM – Value Stream Map

VSL – Value Stream Leader

WIP – Work In Process (or Progress)

Suggested Reading:

- *The Complete Lean Enterprise—Value Stream Mapping for Administrative and Office Processes*, Beau Keyte and Drew Locher, Productivity Press.
- *Creating Mixed Model Value Streams*, Kevin Duggan, Productivity Press.
- *Kanban Made Simple….*, John Gross and Kenneth McInnis, Amacon.
- *Lean Thinking—Banish Waste and Create Wealth in Your Corporation*, James Womack and Daniel Jones, Free Press
- *Learning to See*, Mike Rother and John Shook, The Lean Enterprise Institute.
- *Seeing the Whole—Mapping the extended Value Stream*, James Womack and Daniel Jones, The Lean Enterprise Institute.
- *The Toyota Way Fieldbook*, Jeffrey Liker and David Meier, McGraw-Hill.

Footnotes:

1. James Womack and Daniel Jones, *Seeing the Whole—Mapping the extended Value Stream*, (Cambridge, MA: The Lean Enterprise Institute, 2002), p. 1.
2. James Womack and Daniel Jones, *Lean Thinking—Banish Waste and Create Wealth in Your Corporation*, (New York; Free Press, 2003), p. 19.
3. Ibid., p. 44.
4. Toshiko Narusawa and John Shook, *Kaizen Express—Fundamentals for Your Lean Journey*, (Cambridge, MA: The Lean Enterprise Institute, 2009) p. 19.
5. Womack and Jones, *Lean Thinking—Banish Waste and Create Wealth in Your Corporation*, p. 21.
6. Womack and Jones, *Seeing the Whole—Mapping the extended Value Stream*, p. 8.
7. Jeffrey Liker and David Meier, *The Toyota Way Fieldbook*, , (New York: McGraw-Hill, 2006), p. 50.