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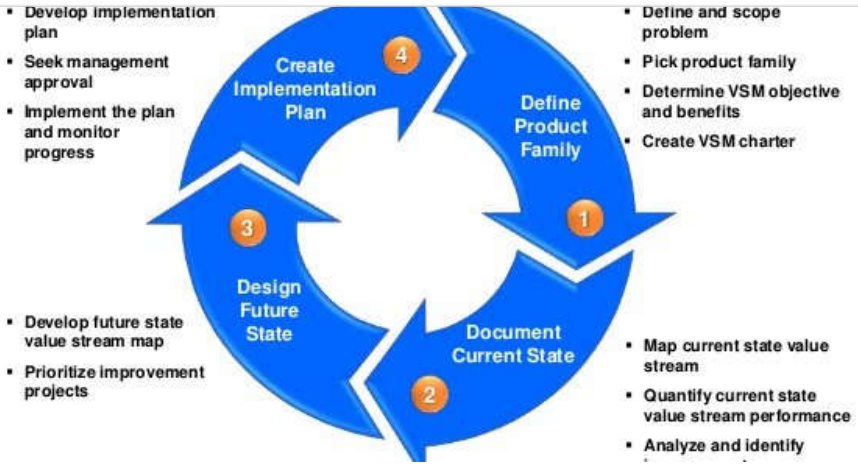

What is Value Stream Mapping Explained By Gabriel Daniels PE. Lean Six Sigma Master Black Belt

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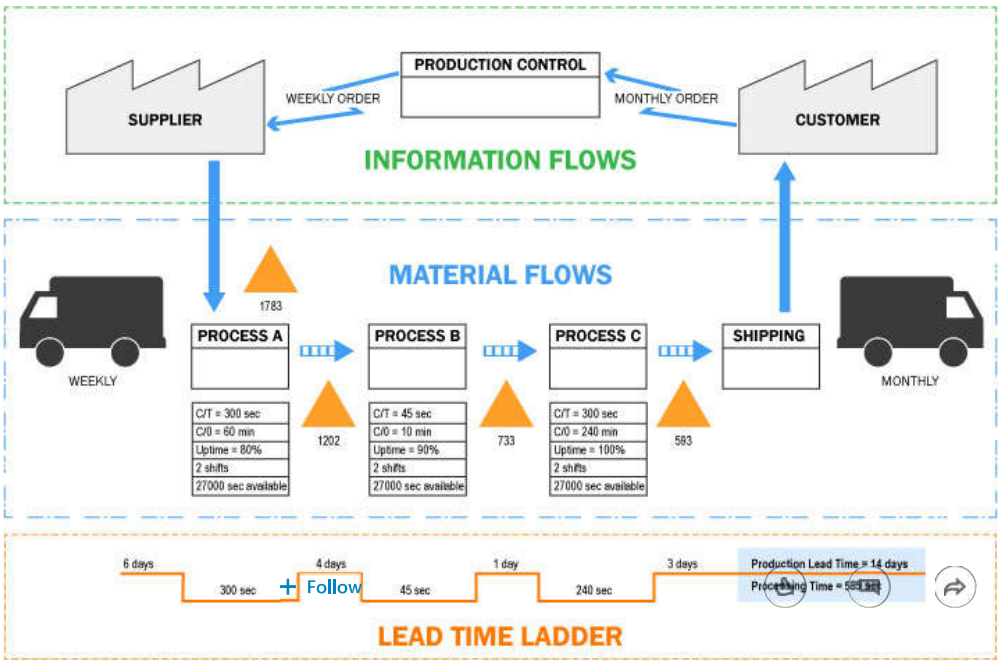

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WHAT IS VALUE STREAM MAPPING?

Value stream mapping is a flowchart method to illustrate, analyze and improve the steps required to deliver a product or service. A key part of the lean methodology, VSM reviews the flow of process steps and information from origin to delivery to the customer. As with other types of flowcharts, it uses a system of symbols to depict various work activities and information flows. VSM is especially useful to find and eliminate waste. Items are mapped as adding value or not adding value from the customer's standpoint, with the purpose of rooting out items that don't add value.

It's important to keep in mind that customers, whether external or internal, care about the value of the product or service to them, not the efforts it took to produce it, or the value that may flow to other customers. Value stream mapping maintains that focus. A typical process is to draw a current state VSM and then model a better way with a future state and/or ideal state VSM. You can start off sketching by hand and then move to VSM software for better communication, analysis, and collaboration.

HISTORY OF VALUE STREAM MAPPING

This type of mapping may be older than many people think. Examples of diagrams showing the flow of materials and information are contained in a 1918 book called *Installing Efficiency Methods*, by Charles E. Knoeppel. Later, this type of diagramming became associated with the vaunted Toyota Production System and the whole lean manufacturing movement, although it was typically called material and information flow mapping, process mapping or other names, not value stream mapping. The people most often credited with creating the Toyota Production System, starting in earnest in the 1950s, include: Shigeo Shingo (1909-1990), a Japanese industrial engineer, Toyota consultant and namesake of the Shingo Prize for lean excellence; and Toyota executives Taiichi Ohno (1912-1990); Kiichiro Toyoda (1894-1952) and Eiji Toyoda (1913-2014).

By the 1990s, as lean production methods in manufacturing and other fields were spreading to the United States and worldwide, "value stream map" became an increasingly common term for them—and VSM became central to lean methodology in many places. Value stream mapping also came to be used in Six Sigma methodologies. Lean and Six Sigma both have the same goal: to eliminate waste and create the most efficient system possible. But they identify waste differently. While lean practitioners focus on non-valued-added activities, Six Sigma followers focus more on process variations resulting in waste. E
successful in different situations, leading to the formation of Lean Six
approach.

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manufacturing. That's its core purpose. You detail each significant pro
how it's adding value—or not adding value—from the customer's stan
value keeps the analysis targeted to what really matters, allowing the c
most effectively in the market. Foreseeing or facing any competitive threat, lean practitioners can make good use of VSM to produce the most value for the customer in the most efficient way possible. It can and should be used on an ongoing basis for continuous improvement, bringing better and better process steps online. VSM allows you to see not only the waste but the source or cause of the waste.

Value stream mapping, as with other good visualizations, serves as an effective tool for communication, collaboration, and even culture change. Decision makers can clearly visualize the current state of the process and where waste is occurring. They can see problems like process delays, excessive downtime, constraints and inventory issues. And with the Future State and/or Ideal State VSM, they can see precisely how to improve.

Although its typical purpose is eliminating waste, VSM can also be seen from the perspective of adding value. After all, that's what the customer cares about. Eliminating waste is the means to an end of creating value, such as a lower price and/or better-quality product or service. Value is something a customer is willing to pay for. The title of a popular VSM book is even: *Learning to See: Value Stream Mapping to Add Value and Eliminate Muda*, by Mike Rother and John Shook. (*Muda* is lean terminology for waste.)

VSM CAVEATS

While Value Stream Mapping is core to lean methods, it often requires a substantial investment of people and time to do it, and if not applied wisely, it can be wasteful in itself. You, of course, want profitable applications of value stream mapping.

It requires team members skilled in carrying out advanced VSM, and it may take days, weeks or even months to carry out some involved mapping projects. Think of it as a powerful tool central to lean methods, but not every circumstance lends itself to value stream mapping. You need to balance potential value with the work necessary to conduct the VSM.

You might choose to start small, with a limited focus and a limited budget, get the win and then move on to something more complex and potentially rewarding. Oftentimes, senior leaders may try to bite off something too large initially, and the effort may struggle due to its complexity and possible inexperience of the team.

Potential uses of more extensive VSM include:

- Cases involving multiple functional areas or departments.
- When a less detailed process map isn't likely to uncover information you can act on.

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translate to a bottom line improvement. Often, a fuller look will be required.

However, keeping those caveats in mind, an individual could try VSM on a budget for a simple review that might produce results or at least help you to better understand VSM. After reading up on the basics (and you're off to a good start with this article), you might just grab a pencil and legal-size pad, and armed with the step-by-step instructions listed later in this article, start mapping. You'll map out the process steps, data for each step (such as cycle time), improvements you think you could make for an "ideal state," and a summary showing how your improvements help each data point and overall value. Just keep in mind that this would be a tiny taste of what expert value stream mapping can accomplish.

HOW VSM IS USED IN DIFFERENT FIELDS

In manufacturing: To find waste in the production process by analyzing each step of material handling and information flow. This is where lean methodology got its start in the 1950s at Toyota, and lean methods and value stream mapping remain key to manufacturing throughout the world. Of course, they have since spread to other fields and have become intertwined with Six Sigma methods and Lean Six Sigma.

Supply chain and logistics: To root out waste and costly delays at the various points on the supply chain leading to the finished product.

Software engineering/development: To find inefficiencies in software development, from idea to implementation, including feedback loops and rework. Although some critics question the value of VSM in an agile development environment, others find it useful to gain efficiencies, such as reducing wait time between steps or reducing the need for rework.

Service industries: To improve the value and find waste in the activities required to carry out any service for external customers.

Healthcare: To improve the steps required to treat patients in the most effective, timely, cost-efficient, high-quality way possible.

Office and administrative: To find wasteful steps and improve the service provided by a business to internal customers.

In value stream mapping, the process items that flow through the value stream are determined by the field. For example:

- In the manufacturing industry, materials are your items.
- In the design and development field, designs are your items.
- In service field, external customer needs are your items.
- In the administration field, internal customer needs are your items.

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WHAT SYMBOLS ARE USED

VSM symbols vary in different places, but they fall into these four categories: process, material, information and general. The symbols can be complicated, although some simply imply their meaning in a layman's sense, such as a truck icon for external shipments and eyeglasses for something to go see. Here are some widely used symbols.

In lean theory, the "value stream" refers to all of the actions required to bring a product or service from concept or raw material to finished good. Each action contributes value to the finished product, ideally working together efficiently to create a continuously flowing stream of value. The first step toward creating a lean environment – increasing value and removing waste – is analyzing the value stream. This provides the foundation for creating an improvement plan. By examining the current state of a system, actions that add to value creation can be clearly separated from those that create waste, making it easier to locate opportunities for improvement.Value stream mapping supports stream analysis by simplifying a complex system into a map. The map illustrates the outcomes of the value stream analysis, providing a visual tool to facilitate understanding and communication. The next section outlines the steps for completing a value stream analysis, creating a current state map, developing future and ideal state maps, and ultimately carrying out a lean plan. These steps are best practices for VSM and provide organization to value stream analysis, hopefully leading to the best possible outcome: an efficient and integrated material and information flow system.

Value Stream Mapping Symbols and Components

A value stream map is made up of a three distinct looking parts: a process map, a corresponding timeline and information flow. The process map is comprised of the steps and the information associated with the steps of your process. The timeline automatically builds from the process map and calculates the data entered. The information flow further explains the interaction and activity between the stations of your value chain.

There's usually also a box in the upper left corner of any value stream map that lists the constants of the value stream map. You add the Demand, the units per day that must be produced for instance, and the Hours, the time available to get the work done, and the Takt, the rhythm required to do the work, is automatically calculated for you.

Value stream mapping uses a set of unique symbols to visualize a process.

Process. A process is represented with a rectangle and the word "Process". To make the

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process.

Shipment. A shipment of raw materials from suppliers are represented with blank wide arrows. A pushing of materials from one step in the process to another is usually marked with a black arrow with three white squares inside. Shipments made using external suppliers is represented with a truck or another vehicle where applicable such as boat or train.

Supplier and Customer. Suppliers and customers share the same symbol that looks like an abstract, geometric representation of a factory. A supplier usually will mark the beginning of a process and will be found to the left of the value stream, while a customer is often found as the last step, to the far right of the value stream map.

Electronic flow. A line with a zig-zag in the middle refers to electronic information and data exchanges. While a lot of value stream mapping focuses on raw materials and products, electronic exchanges should also be examined because they can be the root of delays and waste.

Kaizen burst. A Kaizen burst, also known as a Kaizen blitz, refers to a short burst of activity that solves a problem with intensity and urgency. Appropriately, it's represented with what looks like a cartoon explosion.

Go see. A go see refers to confirming something visually during the process and it's often represented with a pair of glasses.

Quality. A quality problem anywhere along the chain can be marked with an octagon, like a STOP sign, with the letter Q inside.

HOW TO CONDUCT VALUE STREAM ANALYSIS, STEP BY STEP

The wording here includes examples from lean manufacturing, but you can apply these steps to software engineering, service industries, healthcare or other fields, as discussed earlier in this article.

1. Identify the product or product family to be studied and improved. You typically put together a team to do the mapping and analysis, depending on the size of the initiative. If inexperienced, the team will need training in VSM. Some larger companies may have a value stream manager.

2. Get leadership's buy-in for the value stream mapping project, given the potential costs involved. It's possible you might use a smaller VSM, showing potential improvement, to help gain leadership's buy-in for a fuller look.

3. Determine the problem for the value stream for this product, from the customer's standpoint. You could use A3 analysis of root causes to do this. Make sure the customers' concerns are clearly understood since they are the ones defining value. It's

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4. Bound the process, which means determining the limits or scope of your map. For example, if you're doing lean manufacturing, are you going from raw materials to final product delivered to the customer? Or are you starting with one problematic part of the value stream?

5. Now, do the VSM walk, as outlined in upcoming steps 6-11. Walk (or directly experience) the process steps and information flow required to put out the product or service. Some veteran practitioners do the walk in reverse, starting with the customer. You might do the walk multiple times to gather more information, filling in any gaps.

6. Define the process steps, keeping within the boundaries you've just defined as you do your walk. In lean manufacturing, all of the steps might take place in a single location that inventory enters and then leaves. You aren't listing out every specific task that could be done by process mapping. You are studying work activities and information flows that produce customer value or don't. It's vital to record the reality of your observations, and not rely on information from employees who may have a vested interest in explaining away a problem. The purpose is to document each significant step required to create the product's value.

7. Collect process data on your walk. This is where you start evaluating the performance of each step of the process. Examples are inventory type and size, cycle time, change-over time, machinery or process uptime and downtime, number of workers, shifts worked, available working hours and batch size. All of these could result in finding efficiencies and cutting waste. Add that process data to the data boxes of your Value Stream Map.

8. Evaluate the process steps. You also use data boxes for this information. We want to know whether the process step is: a) Valuable, meaning it creates value from the customer's standpoint. You might just ask the customer if he cares whether a step is left out. b) Capable, the degree to which there's a high-quality result every time. c)

   Available, the degree to which the process step is available when needed. d) Adequate, the degree to which capacity exists to meet customer demands. This often ties in with analysis of constraints, bottlenecks, excess capacity and excess inventory. e) Flexible, the degree to which a process step can switch over quickly and inexpensively from one member of a product family to another. This has been key to Toyota production over the years.

9. Map the movement of the product and information flows. Look for three key things: a) Flow vs. Stagnation. The ideal is for the product to never stop moving. This can be measured by inventory levels. b) Push vs. Pull. This shows how production information is handled. In the ideal value stream, no information is required except for a signal at the top of the stream to make the next product. In reality, however, there are disconnects between parts of the stream. This is dealt with by having the steps able to signal each other as to upcoming needs. c) Level vs. Erratic. This shows the degree to which the process has been smoothed out for efficiency. This addresses the lean manufacturing concepts of mura (unevenness), muri(overburdening of the value stream to keep up)

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ensure that customers get what they want.

10. Count the inventory. Inventory and overproduction can be an extensive cause of waste. Take special note that inventory may be scattered in a makeshift manner.

11. Create a timeline. Map out process times and lead times for inventory through our process steps. By monitoring inventory levels at each step, we can find inefficiencies and non-value-adding items in our production.

12. Now, reflect on the Value Stream Map to see things that might not have been entirely apparent at first. Use the information you've collected in the data boxes and timeline to find the waste. This could be problems such as excess inventory, too much downtime, long process times or setup times, or quality problems resulting in rework.

13. Then, create a future state Value Stream Map and/or ideal state Value Stream Map. Instead of just attacking each problem point individually, now sketch out an ideal state VSM, illustrating goals for the items that lead to a leaner, more effective process. This vision needs to be agreed upon by the leadership and becomes the ultimate goal of the VSM project. The Value Stream Maps are used to communicate and guide the work. Use the attention-grabbing "kaizen burst" symbols on your current state VSM to clearly communicate the coming improvements. (Kaizen is a Japanese word roughly translating as "good change" or "continuous improvement.") Sometimes a series of future state Value Stream Maps are drafted before reaching the ideal state Value Stream Map.

14. Using the Value Streams Maps as your basis, create an implementation plan and carry it out. Consistently monitor the results in key metrics, and implement further adjustments as necessary. You are on the path to continuous improvement.

KEY TIPS FOR VSM

1. Experience directly. You (or your team) should follow the whole value stream yourself. Don't rely on impressions, assumptions, or conversations about how things "usually" happen. If it's a physical thing, walk it, use a stopwatch to time various steps, and experience it all as directly as possible. At least one team member needs to walk the whole stream. If you rely on subteams to walk different portions, and nobody walks the whole thing, you will miss an essential perspective to VSM.

2. Sketch an initial VSM by hand. Start by sketching in pencil as you document the steps. Later you can use chart-drawing software to communicate and collaborate better and map out a future/ideal state.

3. Do initial walk-through. You might start with a quick walk to experience it at an overview level, and then do it again in more detail.

4. Try doing it in reverse, from end product or service to its origins. Various items could become more clear and meaningful with that perspective. Many veteran VSM practitioners do it this way.

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