

Kelly A. Slate and Chandis Digby

## Increasing Customer Satisfaction by Redesigning Your Supply Chain

### INTRODUCTION

For years, supply chain leaders have faced the dilemma of how to improve customer satisfaction and corporate profitability at the same time. According to George W. Plossl in production and inventory control, there are three objectives in most manufacturing firms intent upon earning profit:

- maximum customer service
- minimum inventory investment
- efficient (low-cost) plant operation.

If Plossl, the father of planning (and a hero to my boss) believed it could be done in 1967, then why do we continue to struggle with accomplishing all three objectives at the same time today? We still have a difficult time convincing the entire supply chain that it can be done. Is it because each member of the supply chain continues to focus on one objective more than another? For example, traditionally the business team works on customer service, the planning team works on inventory, and the manufacturing team works on plant operation. Or is it because we have not educated the members on how we can accomplish all three objectives? Just as Plossl believed it was the responsibility of the supply chain to reconcile these objectives, we believe the same. First, we modified the three objectives to help educate our team members how each one has a direct impact on return on investment (ROI). This way, each member of the supply chain can understand how meeting the objective will benefit the business in total and be more willing to support change.

- **Maximize customer satisfaction** by increasing value, increasing sales, and increasing profit.
- **Minimize inventory investment** by reducing non-value added, reducing current assets, increasing asset turnover and/or reducing non-value added, reducing direct expenses, and increasing the net profit margin.
- **Ensure efficient plant operations** by reducing non-value added, reducing the cost of goods sold, reducing expenses, and increasing the net profit margin.

Second, we insisted that the best method for implementing all three objectives is to redesign the supply chain versus attacking one piece at a time. Based on our learnings from Plossl, APICS conferences and magazines, and APICS certification references, we established a process for our teams to utilize when leading supply chain projects. Through this process, we can demonstrate to team members that we can accomplish all three objectives by redesigning the supply chain for the product line.

The purpose of this paper is to explain the following:

- Why do we need to redesign the supply chain?
- How do we redesign it so that we meet the three objectives?

Before we show an application of this model to a supply chain situation, we will explain how the methodology works.

### WHY DO WE NEED TO REDESIGN THE SUPPLY CHAIN?

Most supply chain managers find themselves working on specific projects within a supply chain for a product or product line. This usually happens when the supply chain organization is decentralized, or there is no organized project management process in place. Projects are worked on one at a time in response to other issues that have come up (also known as fires). Working on individual projects seems to be easier than taking on the entire supply chain because it requires less resources and time, and the outcome may appear to be successful when looking at results in a silo. However, if you try to fix the supply chain piece by piece, you will always be trying to improve it and will never achieve the best outcome. There are several problems with this approach:

- The customer's needs are not always taken into consideration.
- Project priority is often reactive instead of proactive.
- The best solution is not always identified because we are not looking at the total picture.

- The impact on profit is not always accurate because we often look at the impact on that one area of the supply chain rather than on the total supply chain.

## HOW DO WE REDESIGN IT SO THAT WE MEET THE THREE OBJECTIVES?

**Step 1:** The best methodology to redesign the supply chain is value stream mapping (VSM). VSM identifies the value added activities and non-value added activities in the current supply chain. It includes creating a future state map to help us envision our supply chain with less non-value added steps or waste. It allows us to improve the flow of the product and information through the supply chain. Once our supply chain is lean, new opportunities can be identified and corrected much faster. There are five basic steps in value stream mapping:

- Specify value.
- Identify the value stream for each combination of goods and services.
- Make the value-creating steps flow.
- Let the customer pull value from the system.
- Relentlessly pursue perfection.

VSM can be intimidating at first, but we do not have to capture every piece of data to obtain a benefit. Once we understand how to create a VSM, how to use the lean manufacturing techniques to improve flow, and begin using the tool, we will become more comfortable. The ability to visualize the future state and the improvements that are possible is very powerful.

**Step 2:** Involve representatives across the supply chain from the beginning of the project. This includes process engineers, planning managers, development managers, customer service representatives, production associates, financial managers, business representatives, and the customer if possible. Two of the members that are required, but are often left off, are the

business and financial representatives. We need someone from the business to ensure that we are aligned with the business strategy. We need someone from the financial team because we will eventually tie every improvement to the business return on assets (ROA) model. When we are asked to demonstrate and validate our findings later, we will be able to present the financial results to the business with both members confirming the findings. This is very important. The results of redesigning a supply chain are usually significant and will get attention. Having a member from the financial and business team fully engaged helps to avoid incorrect assumptions during the project and doubt after the project.

If we redesign the supply chain using the VSM process and engage members from across the supply chain, the results will include adding value to your customer and reducing non-value added activities. Remember, increasing value can add to increased billings, which can lead to increased ROA. Reducing non-value added activities can reduce the cost of goods sold, direct investment, and/or current assets that can lead to increased ROA. Now we have just accomplished all three objectives.

This approach has been very successful for us and can be used for any supply chain. Next, we will demonstrate an application of this model to a supply chain for one of our product lines.

## CASE STUDY

First, we identified the supply chain project. We selected a product line with a decreasing customer satisfaction score for the past three years. We knew that if we did not do something different, the billings would soon follow the same trend. This project supported the business strategy for growth and had business support from the beginning. In addition, the marketing analyst was willing to support the project by co-sponsoring the team with us. Once we identified our project and team sponsors, we selected the remaining team members. We invited members from across the supply chain to come to the manufacturing

<b>Project Sponsors:</b>	Supply Chain Director	Marketing Analyst
<b>Project Members:</b>	Lab Manager	Plant Supply Chain Leader
	Process Engineers	Plant Leader
	Sales Representatives	Customer Service Leader
	Customer Service Representative	

Table 1.

AREAS DECLINING IN THE CUSTOMER SATISFACTION SURVEY	
1. Lead Time	4. On-Time Shipment
2. Late Order Resolution	5. Emergency Response
3. Order Minimums	6. Sample Delivery

**Table 2.**

location for our kickoff meeting. (See **Table 1**.)

Our first mistake was that we did not include a member from the financial team and production team. We did have to involve them later. After reviewing the three objectives for our team, we were ready to start with the VSM process. It was the first time a supply chain project had been approached this way in this area of the company. Of course, not everyone believed we could meet all three objectives—yet. As the doubters began to doubt, we stuck to our plan and assured them this could be done.

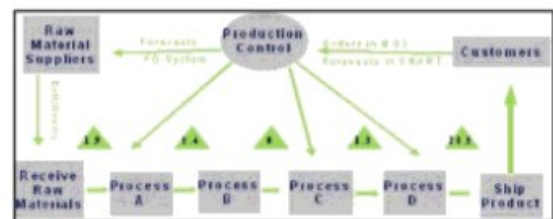
### Specify Value

We had to understand what the customer was defining as value. As noted by James P. Womack and Daniel T. Jones in *Lean Thinking*, the critical place to begin any improvement effort is clear specification of the value of a product as perceived by the customer. Otherwise, you run the risk of improving a value stream that efficiently provides the end customer with something other than what's really wanted. The first step in VSM should be to specify customer requirements. For our project, we determined the customer wanted us to be able to deliver the product when they needed it. In addition, the industry standard was seven days for lead time, and we were offering 14 days. Although we kept some inventory, we would not always have the inventory needed by the customer. Our customer satisfaction survey was declining in six areas (see **Table 2**).

All areas refer to our current delivery process—how quickly we can or cannot deliver, the increments we currently deliver, and how we communicate when we are not able to deliver as requested. We look for those steps that add value and improve these areas, then reduce the steps that are not contributing to value.

### Identify the Value Stream

The team reviewed the current order fulfillment process and walked the manufacturing process together. The team began preparing a current state map with inventory. The days of inventory are represented in the triangles in **Figure 1**.



**Figure 1.** Example of Current State Map In-Process

Immediately, we could see our opportunities. We had 28 and a half days in finished good inventory turns, and we were still quoting two weeks on orders. We continued with the mapping process to see what other opportunities we could find.

### Make the Value-Creating Steps Flow

The team reviewed the lean strategies to see how we could improve the flow of the value creating steps. Lean strategies include determining where we can use continuous flow and where we need to implement pull systems. First, we determined that our cycle time for manufacturing finished goods was less than customer expectations; therefore, we did not need to keep any finished goods inventory. This was a difficult sell to manufacturing because although we had excess capacity, one piece of equipment had very low

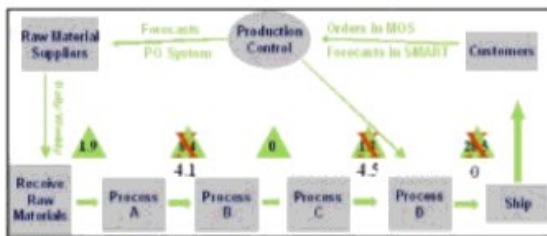
#### INITIAL FINDINGS FROM CURRENT STATE MAP

High level of Finished Goods	High Level of Aged Finished Goods
High level of Intermediate Inventory	High Level of Aged Intermediates
Low Process Reliability	High equipment downtime
Excess Capacity	Excess Labor Variances

**Table 3.**



process reliability. This piece of equipment did not always have available time to schedule the product by the customer's requested date. We found we were spending much more time testing the product than what was in the standard. Not only was this adding downtime, but it was also adding cost. This was a big problem, but we knew it could be solved. This would become a process improvement project to understand and reduce the downtime. As we envisioned improvements in the supply chain, we would add them to our future state map. The proposed changes to inventory are represented in **Figure 2**.



**Figure 2.** Example of Future State Map In Process

### Let the Customer Pull Value from the System

We had determined we would establish kanban at the intermediate inventory level to control the production between flows. This allowed us to initiate production to replenish inventory only when the customer needs it. Intermediate inventory refers to the inventory for intermediate products. Intermediate products are those that have gone through a production process and have a new stockkeeping unit (SKU) but are not considered to be a finished good available to sell at this time. It had little visibility before the mapping process and was not included in the standard inventory management process. This intermediate inventory was essentially in a black hole, aging secretly due to the lack of visibility and attention. Based on our changes, we were able to wait until the customer called with the order to manufacture and ship the product within the requested delivery time. This was an important find in itself. Not only would it eliminate aged inventory to be sold off later, but it would eliminate a shelf life issue, as well.

### Relentlessly Pursue Perfection

After reviewing our current issues and the lean strategies, we identified the several changes to

the supply chain that would be required to get us to the future state. We created an implementation plan that included teams and owners for each action item to ensure they were documented and executed. We then held the owner and the teams responsible to report on the status of the action in the product line review meetings. The teams maintained measurements, including aged inventory, actual cycle time, actual delivery versus customer requested date, labor variances each period, percent actual margin, and percent earnings before interest and taxes (EBIT).

### COMPARING RESULTS TO THE OBJECTIVES

We wanted to put our process to the test and see if we were able to achieve all three objectives.

- 1) **Maximize customer service:** Prior to the project, we told customers we needed 14 days to ship product. Now we can guarantee product shipping within seven days. We started asking the customers, "When do you need the product," and we made plans to meet the date requested. Often this has been less than seven days, and we have been able to meet it every time.
- 2) **Minimum inventory investment:** We have reduced the total inventory in the supply chain by 75 percent and have been able to maintain this level.
- 3) **Efficient (low-cost) plant operation:** We did increase cost by increasing equipment changes to respond more quickly. However, we offset these costs by reducing non-value added steps and reducing labor variances.

So far, we have met all three objectives. Now we wanted to know if we were able to meet all three without having a negative impact on our profitability. Did our ROA go up or down? We have outlined changes in **Figure 3** to demonstrate the changes and the effects on the profit.

### LESSONS LEARNED

The most critical item in making this happen day in day out successfully is educating the members of the supply chain team. This includes understanding the overall objective, working on APICS certification, understanding how to rede-

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<b>Changes</b>	<b>Impact on Net Profit Margin</b>	<b>Impact on Asset Turnover</b>	<b>Impact on ROA</b>
Eliminate Finished Goods Inventory	Reduces direct expenses Increases net profit Increases net profit margin	Reduces inventory Reduces total assets Increases assets turnover	Increase
Change to Make to Order (eliminates aged inventory to sell off or pay to dispose)	Reduces total expenses Increases gross margin Increases net profit Increases net profit margin		Increase
Increased changes (to respond quickly in a make to order environment)	Increases cost of goods sold Reduces net profit Reduces net profit margin		Decrease
Establish inventory levels for Intermediates	Reduces direct expenses Increases net profit Increases net profit margin	Reduces inventory Reduces total assets Increases assets turnover	Increase
Changed manning practices (reduced labor variances)	Increases gross margin Increases net profit Increases net profit margin		Increase

**Figure 3.** Impact on Profit

sign a supply chain, and knowing how to read a financial model. Once the team understands how this works and practices with it, the team will start envisioning the future state automatically. As we found on the first page of *Learning to See* by Mike Rother and John Shook, whenever there is a product for a customer, there is a value stream. The challenge lies in seeing it. When our team is able to “see it,” we will have lean supply chains that always deliver increased customer satisfaction, minimum inventory investment, and efficient plant operations.

### **ABOUT THE AUTHOR**

Kelly Slate is currently the director of supply chain for the chemical division within Milliken & Company and is responsible for the domestic and global customer service, inside sales, and supply chain activities for the division.

Chandis Digby joined Milliken & Company in 1993 and has held several positions in manufacturing, including process engineer, senior production manager, and plant manager.