Value Stream Mapping for a Lean Front Office

Uncovering Opportunities in Sales Effectiveness

WHITE PAPER
Cincom In-depth Analysis and Review

SIMPLIFICATION THROUGH INNOVATION®
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Executive Summary

Businesses implementing lean manufacturing bypass the front-office and target their manufacturing processes. After all, front-offices have paperwork, not inventory, right? However, order entry, quoting, scheduling, design, and engineering are front-office functions that can provide an eye-opening opportunity to create improvement, eliminate waste, and increase profits in your business. It’s not uncommon to discover that over 95% of the lead time in your order is found in the office functions – and only 5% of the lead time in the actual production of the product. This white paper spotlights areas of opportunity that are often overlooked, as well as how the seven basic forms of waste can be found in front-office processes.

History of Lean

Information flow and office processes are important to any business and can directly affect lead time, quality, rework, and customer satisfaction. In many cases, a major portion of a product’s lead time is related to inefficient and ineffective order processing and scheduling in the office not on the factory floor. To better understand the opportunities that lie in the front office, it is important to understand how Lean Manufacturing became such a critical tool.

The history of Lean Manufacturing can be traced back almost 100 years in some guises. Here is an overview.

Taiichi Ohno is regarded as the founder of the Toyota Production System (TPS) that was developed in 1950 following an excursion to the Rouge Ford plant in the US by Eiji Toyoda, a young engineer who reported his findings on the Ford system back to Ohno.

James Womack (1990) coined the phrase “Lean Manufacturing” to describe TPS when they printed the results of a five-year study into the automotive industry in the book The Machine that Changed the World. Ohno (1998) describes the most important objective of the TPS as increasing production efficiency through consistently and thoroughly eliminating waste. The following figure illustrates how TPS differs from traditional approaches to improve productivity through adding resources, and illustrates the impact of waste elimination on production lead-time.

1 http://www.beyondlean.com/history-of-lean.html
So What Is Waste?

Womack defines waste as any activity that consumes resources but adds no value as specified by the customer. In order for us to understand the waste within any enterprise activity, Ohno broke waste up into seven elements:

The Seven Wastes

1. Overproduction - Producing things ahead of demand
2. Waiting - Inability to move to the next processing step
3. Transport - Unnecessary movement of materials between processes
4. Over-processing - Inappropriate processing of parts, due to poor tool and/or product design
5. Inventory - Storing more parts than the absolute minimum
6. Movement - Unnecessary movement of people during the course of their work
7. Defects - Production of defective parts

The seven wastes commonly found in physical production describes the four key elements of a TPS as:

- **Just In Time (JIT)**
- **Jidoka**
- **Standardized Work**
- **Kaizen**

In general, terms the key elements of Lean Manufacturing work together to continually improve production processes. Put simply, waste elimination is accomplished through JIT and Jidoka, maintained through Standardized Work, and improved through Kaizen.

**Just In Time (JIT)**

Producing what is needed, when it is needed, in exactly the amount needed (using pull systems [Kanban], continuous flow processing, and synchronizing the production speed.)

**Jidoka**

The ability of production to be stopped in the eventuality of a problem, either by the machines themselves or by people (using stop systems and error proofing).

**Standardized Work**

Standardize procedures concentrating on the most efficient human movements and work sequence for each process.

**Kaizen**

Never-ending job design through continuous improvement.
Common Wastes in the Front Office

1. Information Defects

Information defects refer to anytime an information item is either incorrect or missing. A general rule of thumb is that man is only 80% effective in interpreting and processing information on a repetitive basis. Starting out with incorrect information only serves to have an exponential effect on the Customer Fulfillment process. The negative effects can be measured:

- Inaccurate depiction of customer needs
- Inaccurate application of products or services to meet customer needs
- Poor fitness of price to satisfy both customer and organizational needs
- Poor fitness of delivery conditions

There are three common categories of information defects in the customer fulfillment process:

**Obsolete Product Feature Defects**

An obsolete product feature defect occurs when a product feature selection is made knowingly or unknowingly that has changed or is discontinued, and therefore no longer meets the needs of the customer. The most common reasons are:

- Product modifications are made, but the changes have not been effectively communicated out to the sales channels.
- Product modifications have been communicated to the sales channels, however, the sales systems have not been updated.

**Incorrect Pricing Defects**

Pricing is a two-part activity. The first part of pricing involves creating a list price for the product. This is generally based on several factors:

- Product cost (material, labor, burden)
- Anticipated profit margin
- Prevailing market conditions (competition, local markets, product life cycle position)

Since the target profit margin for a product is the most stable factor in the list price, defects are typically a result of dynamics of cost and market. That is, with the increasing effects of a global economy, material costs of steel, petroleum, and other natural resources can change suddenly. List prices then fail to reflect the true cost structure of the product and could greatly reduce a product’s ability to perform in the market.

The second part of pricing is that of creating the appropriate selling price for an opportunity. Generally, there are three factors that determine the selling price:

- Sales-channel profitability
- Customer-preferred incentives
- Rebates or pass throughs²

The selling price defects can have a significant impact on sale-channel performance. Priced wrong, sales-channel profitability can be negatively affected. If a channel cannot recoup the cost of sales and meet its own profit targets, it may ignore or limit selling a particular product in favor of a competitive product that is more profitable to the channel.

**Incorrect Product Feature Defects**

Incorrect product features involve the selection of an otherwise valid choice by either the sales channel or the customer. It is important to recognize that incorrect selections are made for two reasons:

- The correct customer need was fitted with an incorrect product feature. This is the most typical in that, while the need was authentic, an understanding for how to serve the need was not.
- The correct product feature was fitted to an incorrect customer need. This defect can be rather elusive in that it is often not found until late in the customer fulfillment process, sometime after the product has been produced.

⁡ A pass through is a supplier rebate for a component or option selected by the customer; 100% of the incentive is passed on to the customer
2. Information Over-Processing

Excessive Reviews
It is not uncommon for the customer fulfillment process to have several discrete review sessions prior to order entry. These review sessions typically precede a translation process:

- Initial receipt from the sales-channel; a sales administrator will verify customer and sales channel information prior to logging the opportunity.
- An application engineer will verify product feature selections made by the sales channels.
- A pricing analyst will verify that the price is accurate.
- A material planner will verify that the deliver dates are supported by the production plan.

Excessive review sessions add unnecessary time delay to the customer fulfillment process and don’t add any additional value from the customer’s perspective.

Obsolete Documents or Forms
Throughout the life cycle of the customer fulfillment process, temporary process work-arounds, deviations, and customer-specific activities have produced process tasks that have become unnecessary. However, for one reason or another, the temporary process tasks and the supporting documentation were not removed from the official customer fulfillment process. Many times the originator of the added process task is no longer with the organization or has assumed other responsibilities.

Redundant Data Processing (“The Excel Effect”)
Another source of information over-processing is better known as the “Excel Effect.” Here is an example:

“Opportunities are entered into a tracking system. Because he cannot access the tracking system, or get the data out in a specific format, the sales manager creates a spreadsheet to track opportunities, pipeline planning, etc. The engineering manager needs to monitor the opportunities that he has assigned to his department. To do this, he uses the company’s PDM system to monitor the opportunities. Throughout the customer fulfillment process, critical opportunity information is processed in several different systems …”

It quickly becomes evident from this example that changes to customer needs and product solutions must propagate through redundant processes that add considerable time and effort to the customer fulfillment process.

3. Information Idle Time (Wasted Time)
Because the customer fulfillment process is usually a manually driven, asynchronous process, there is almost always a queue in front of each process task. These queues can stretch the customer fulfillment process timeline as much as 600% (see next section). There are several process tasks where time delays from waiting are typical:

- Waiting for cost and price estimates
- Waiting for engineering approval on specials
- Waiting to generate a correct proposal
- Waiting for commitment from manufacturing or procurement
**Hidden Wastes**

While the common wastes in the front office are considerable, there are a couple of underlying wastes in particular that can significantly constrain an organization’s ability to serve it’s customers and at the same time, satisfy organizational goals:

1. **Lost Scalability of the Sales Force**
   For each day that a sales channel is unaware of (or uncertified on) new products, product enhancements, and customer applications, revenue is lost. Rapid development and deployment of value streams that support and educate the sales channels is essential to a new product rollout. Sales effectiveness is increased with the knowledge of related products and their fit with customer needs – provided at the point of need. Traditional wastes measured in process delays, rework, and information defects equate to millions of dollars in lost revenues, market share erosion, and customer retention.

2. **Adaptability of Getting New Products to Market Sooner**
   In today’s competitive business environment, wastes in information defects, redundant data processing, and information idle time can dramatically affect how new products are developed and brought to market. Having a comprehensive Value Stream that coordinates information flow between sales and marketing, product development, and production for New Product Introduction (NPI) is central to achieving these objectives. According to AMR Research, companies that do not effectively manage their New Product Introduction (NPI) processes can be up to 56% later to market. Data compiled by consulting firm PRTM indicates that companies also experience up to 26% lower margins due to poor NPI processes. The diagram below illustrates how the presence of information wastes can impact the time to value of a new product introduction.

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3 Kevin O’Marah, Michael Burkett, Debra Hofman; Benchmarking the PERFECT Product Launch: It’s All in the Mix; 2004; AMR Research Inc.
Mapping Your Front-Office Processes

1. Customer Order Fulfillment
The Customer Fulfillment (CF) process typically follows a consistent flow from the salesperson working with the prospective company to jointly define the problem (or opportunity) to the delivery of value in the form of a product or service that meets (and hopefully exceeds) the customer’s requirements. While the following diagram illustrates the CF process for an information technology provider, the key deliverables within each step are consistent in other industries.

The CF process is all about taking the unarticulated needs of the customer and translating them into a solution tailored specifically for that customer. This solution includes not only the actual product being sold, but other more intangible and significant objects like:

- Price
- Terms and conditions
- Delivery requirements
- Customer support tools
- Warranty support

It is important to note that these items are generally the results of several business processes that may or may not be synchronized to the CF process. An example of this may be the production scheduling process, which tries to optimize manufacturing resources, while possibly not supporting the delivery requirements of the customer. When this occurs, time delays frequently result from having to re-prioritize work, both in the office and on the shop floor, or the salesperson is forced to require the customer to pay a premium to get his or her order earlier.

The customer Inquiry-to-Order business process captures the complete interaction between the selling organization and the prospect prior to an actual order being issued. During this phase, it is not uncommon to see as much as 70% of all opportunities experience significant delays and rework due to processing wastes, inaccurate information, or opportunities just plain sitting around. A commonly cited figure is that companies lose 1% to 2% of the annual revenue due to errors in the CF process\(^4\).

\(^4\) Tiihonen, Juha; Product Configurators – Information System Support for Configurable Products; Helsinki University of Technology, 2001
The following Value Stream Map depicts the processing steps typically found in the CF process. Based on representative samples in a complex sales process, the CF process yields six days of value-added activity compared to forty days of non-value-added activity\(^5\). In other words, 85% of the time, the opportunity is either waiting for information from other process tasks, or the information is simply being re-formatted without any additional value added at that process task.

Part of the underlying causes for the wastes found in the CF process can be found in the disparate information systems used by companies to support the customer order process. According to AMR Research\(^6\):

- The average company has 4.3 order-fulfillment and 5.2 order-capture systems.
- Over 50% of US companies have customer orders going through more than one order-management system.
- Only 50% of companies have order-management system that share a common master product and customer database.

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\(^5\) The definition of Value-Add is new information content that further defines the customer specification; Non Value-Add is reformatting of existing information content.

\(^6\) Lapide, Larry, Mixed Mode Customer Fulfillment Forces Integration Beyond SCE; AMR Research, Inc.; 2002
2. Pricing
Pricing is one of the most important, yet least understood, of all the front-office processes. Many business managers establish prices without formal pricing policies, basing them on what competitors charge or on what manufacturers suggest. And, because the pricing process is typically not integrated to the rest of the Customer Fulfillment process, inefficiencies and errors in critical information produce front-office wastes such as:

• List prices that do not support corporate objectives (margins)
• Selling prices that do not support customer acceptance

The results are lower revenues, diminished profits, and pressure on cash flows.

The manufacturer’s pricing decision depends on the support of accurate cost accounting records. The most common technique is cost-plus pricing, where the manufacturer charges a price to cover the cost of producing a product plus a reasonable profit. The cost-plus method is simple, but it does not encourage the efficient use of resources. The following equation is typically used as a basis for cost-plus pricing:

\[
\text{Price} = (\text{Material Costs} \times \text{Material Multiplier} \\
+ \text{Labor Costs} \times \text{Labor Multiplier} \\
+ \text{Equipment Costs} \times \text{Equipment Multiplier}) \\
\times \text{Overhead Markup} \\
+ \text{Outsourced Items} \times \text{Outsource Multiplier}
\]

Cost-plus pricing is typically based on a manufacturing estimate\(^7\). Estimates of the costs associated with manufacturing tasks are made for many reasons. For example, to:

• Justify planned capital expenditure
• Determine likely production costs for new or modified products
• Focus attention on areas of high cost

In principle, estimates are made of the resources required (e.g., materials, labor, and equipment), the cost of those resources, and the time for which they will be used. From these factors an estimate of the costs of carrying out a manufacturing process is made. Accounting methods are usually used, for depreciation and cash flow analysis, when capital expenditure justifications are to be made.

Estimating, however, is typically disjointed from the Customer Fulfillment process, resulting in information delays and queue times for the opportunity. The following Value Stream Map depicts the processing steps typically found in the pricing process. Based on representative samples from typical complex manufacturing price estimating, the pricing process yields six days of value-added activity compared to 27 days of non-value-added activity\(^8\). In other words, 87% of the time, the opportunity is either waiting for information from other process tasks, or the information is simply being reformatted without any additional value being added at that process task.

\(^8\) The definition of Value-Add is new information content that further defines the customer specification; Non Value-Add is reformating of existing information content.
3. “Customer Specials”
It is probably important to first define a “Customer Special.” A customer special represents anything for which a predetermined product variant\(^9\) does not exist. Many times the customer special serves as a means for a customer to specify a unique selection of a feature or option of a given product or service. For example, when ordering a utility vehicle, a customer may request a larger aerial device than currently offered for the selected vehicle chassis. To enable the customer to choose the desired selection of this feature, several analyses must occur:

- Fully describe the customer special in product-specific attributes.
- Perform a product design feasibility on the customer special.
- Perform an economic feasibility on the customer special.
- Modify the product structure accordingly to accept the customer special.
- “Codify” the customer special so that it can be incorporated into the product definition system.\(^{10}\)

Processing customer specials requires that the customer special is described using attributes that are consistent with the product structure. In other words, if for example weight and length are critical to the product structure, then the customer special must be expressed in term of weight and length (among other attributes). This is a common point of failure in that adequate attributes are not discovered in the customer-special specification phase, resulting in inaccurate and incomplete information. This adds unnecessary delays in the Customer Fulfillment process.

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\(^9\) A product variant is a specific product configuration that includes an appropriate set of option selections.

\(^{10}\) Part numbers, option codes, include/exclude rules, etc.
The following Value Stream Map depicts the processing steps typically found in the customer-specials process for a complex product structure. Based on representative samples from typical complex manufacturing product structures, the customer-specials process yields eight days of value-added activity, compared to 15 days of non-value-added activity\textsuperscript{11}. In other words, 47% of the time, the opportunity is either waiting for information from other process tasks, or the information is simply being reformatted without any additional value being added at that process task.

\textsuperscript{11} The definition of Value-Add is new information content that further defines the customer specification; Non Value-Add is reformatting of existing information content.
**Prioritizing Areas of Opportunities**

Analysis is the conversion of Continuous Improvement (CI) data into Continuous Improvement decision-making information. It includes reviewing, prioritizing, and selecting the most critical CI items to address. Opportunities for improving the front office should be analyzed in terms of its consequence on cost, schedule, performance, and product quality. An individual opportunity may impact more than one of these categories. For example, frequent changes to customer needs will impact all four.

A prioritization process may look something like:

- Determine a risk level for each CI opportunity by mapping each opportunity onto a risk matrix, a sample of which is shown below.
- Process improvement teams evaluate the risk level for each CI item and determine when appropriate mitigation plans will be required.
- This decision-making can be facilitated by the use of risk levels agreed to by the management team and the process improvement team.

The risk levels could be defined as:

- **Tolerable Risk** is a condition where opportunity is identified as having little or no effect or consequence on business objectives; the probability of occurrence is low enough to cause little or no concern.
- **Low Risk** is a condition where opportunity is identified as having minor effects on business objectives; the probability of occurrence is sufficiently low to cause only minor concern.
- **Medium Risk** is a condition where opportunity is identified as one that could possibly affect business objectives, customer satisfaction, or order processing lead time. The probability of occurrence is high enough to require close control of all contributing factors.
- **High Risk** is the condition where opportunity is identified as having a high probability of occurrence and the consequence would affect organization goals (revenue, product introduction, etc.). The probability of occurrence is high enough to require close control of all contributing factors, the establishment of opportunity actions, and an acceptable fallback position.
- **Intolerable Risk** is the condition where opportunity is identified as having a high probability of occurrence, and the consequence would have significant impact on strategic organization goals.
At the conclusion of opportunity prioritization, a consolidated list of opportunities is created, and a Process Improvement Action Plan is created and maintained.

<table>
<thead>
<tr>
<th>Probability Severity</th>
<th>Frequent</th>
<th>Probable</th>
<th>Occasional</th>
<th>Remote</th>
<th>Improbable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td>IN</td>
<td>IN</td>
<td>IN</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>Critical</td>
<td>IN</td>
<td>IN</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Serious</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>Minor</td>
<td>M</td>
<td>M</td>
<td>L</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>Negligible</td>
<td>M</td>
<td>L</td>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
</tbody>
</table>

**LEGEND**

- **T** = Tolerable
- **L** = Low
- **M** = Medium
- **H** = High
- **IN** = Intolerable

<table>
<thead>
<tr>
<th>Probability</th>
<th>Description</th>
<th>Severity</th>
<th>Examples of Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent</td>
<td>Not surprised, will occur several times (Frequency per year &gt; 1)</td>
<td>Catastrophic</td>
<td>Greater than 60% slip in order fulfillment schedule; greater than 30% margin erosion; greater than 20% reduction in process efficiency</td>
</tr>
<tr>
<td>Probable</td>
<td>Occurs repeatedly / an event to be expected (Frequency per year 1-10²)</td>
<td>Critical</td>
<td>Greater than 30% slip in order fulfillment schedule; greater than 20% margin erosion; greater than 15% reduction in process efficiency</td>
</tr>
<tr>
<td>Occasional</td>
<td>Could occur some time (Frequency per year 10¹ - 10²)</td>
<td>Serious</td>
<td>Greater than 15% slip in order fulfillment schedule; greater than 10% margin erosion; greater than 10% reduction in process efficiency</td>
</tr>
<tr>
<td>Remote</td>
<td>Unlikely though conceivable (Frequency per year 10² - 10⁴)</td>
<td>Minor</td>
<td>Greater than 5% slip in order fulfillment schedule; greater than 5% margin erosion; greater than 5% reduction in process efficiency</td>
</tr>
<tr>
<td>Improbable</td>
<td>So unlikely that probability is close to zero (Frequency per year 10⁴ - 10⁵)</td>
<td>Negligible</td>
<td>Negligible impact on business objectives</td>
</tr>
</tbody>
</table>
Recommendations

Value stream mapping the front-office process is a powerful tool for understanding the impact of information on the Customer Fulfillment process. We can use these tools to understand and communicate the impact of traditional “push” techniques for information processing, and to visualize how alternative LEAN methodologies can radically improve process throughput and eliminate waste.

Through the systematic and continuous elimination of waste, organizations can realize significant financial benefits12 in the front-office process:

- **A 95% reduction in costs to complete an order.** Nearly every manufacturing company has a rough measure of how much it costs to fulfill an order. The payoff of using a quote-to-order, order-to-cash, sales, or product-configuration strategy is that there is major reduction in the costs of fulfilling orders for customized products.

- **Reduction in order cycle times from 17-33 hours to 30 minutes.** From an AMR Research survey of best practices in sales configuration, the median improvement in order cycle times dropped from worst case, 33 hours, to less than one hour. In aggregate, the order cycle times across all manufacturers were dropped to less than an hour.

- **A 20% to 50% reduction in engineering support for presales tasks.** The cost implications of minimizing engineering support is significant, but the strategic payoff of having engineering focused on new product development is a competitive advantage that takes years to cultivate and grow. Having engineering focused on tactical versus strategic issues can cost any company a product generation.

- **Days Sales Outstanding (DSOs) reductions from an average of 60 to 29 days.** This is a measure of how long it takes a company’s customers to pay their invoices. Analysts see DSO reduction as a sign of increasing customer satisfaction.

About Cincom

For nearly 40 years, Cincom’s software and services have helped thousands of clients worldwide simplify the management of complex business processes. Cincom specializes in the area of business where simplification brings the greatest value to managers who want to grow revenue, control costs, minimize risk, and achieve rapid ROI better that their competitors.

Cincom serves thousands of clients on all continents including BMW, Cooper Power Systems, Siemens, Rockwell Automation, and Trane.

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12 Columbus, Louis; Best Practices in Quote-to-Order: Measuring Quoting Strategies’ Financial Impact; Cincom Systems, Inc.; 2004