REDUCING THE COST OF COMPLEXITY:

This case study reviews techniques used to reduce complexity that resulted in significant bottom-line and top-line growth.

A CASE STUDY

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Complexity has cost and opportunity. The techniques to reduce complexity and its associated costs are often nontraditional or even counterintuitive. Complexity management begins as a three-pronged strategy to align process, organizational structure, and accounting. This alignment is to create and support what W. Edwards Deming would call a "constancy of purpose." The alignment of resources and business results creates a precise focus on customer satisfaction, speed, and accountability as complex reporting, product routings, accounting allocations, variances, overheads, and other forms of complexity are reduced or eliminated.

The eight wastes of lean are: transportation, inventory, movement, waiting, overproduction, overprocessing, defects, and the waste of human potential, knowledge, and talent. The wastes are interconnected, with one often leading to or causing others. Overproduction is often called the mother of all wastes, but overprocessing can often surpass other forms of waste. Overprocessing is the waste of processing something too much or having an unneeded process. One form of overprocessing is complexity: complexity of processes, complexity of organization and communication, complexity of reporting and measuring, and anything else that is more complex than is absolutely needed.

Often referred to as a cut-and-sew operation, I assisted a large factory producing sewn leather and cloth products. The factory had over 4,000 employees and sales over $400 million. A projected 40 percent decline of profitability spurred the factory to reduce complexity and improve quality, delivery, and new product introduction. This effort led to a 35 percent profit improvement instead of the projected decline.

When I first visited the factory it was organized into functional and process departments. Functional departments included maintenance, quality, program management, logistics, engineering, accounting, and human resources (see Exhibit 1). The material moved through the process departments, starting at receiving and then going through lamination (joining cloth or vinyl to foam), cutting, kitting, and sewing before finally

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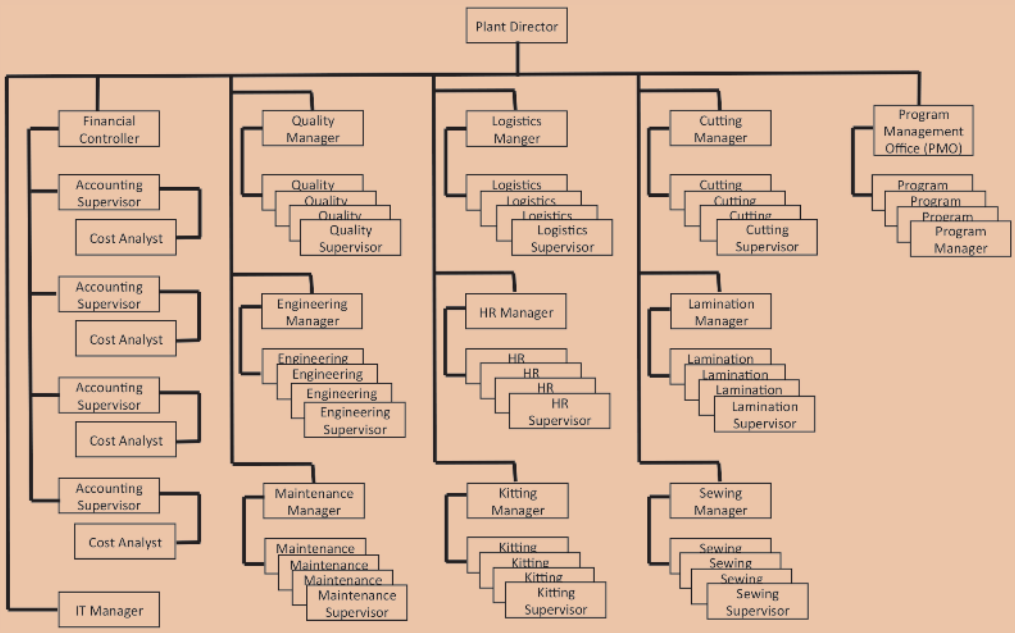
EXHIBIT 1 Organizational Structure Aligned by Department or Function (BEFORE)



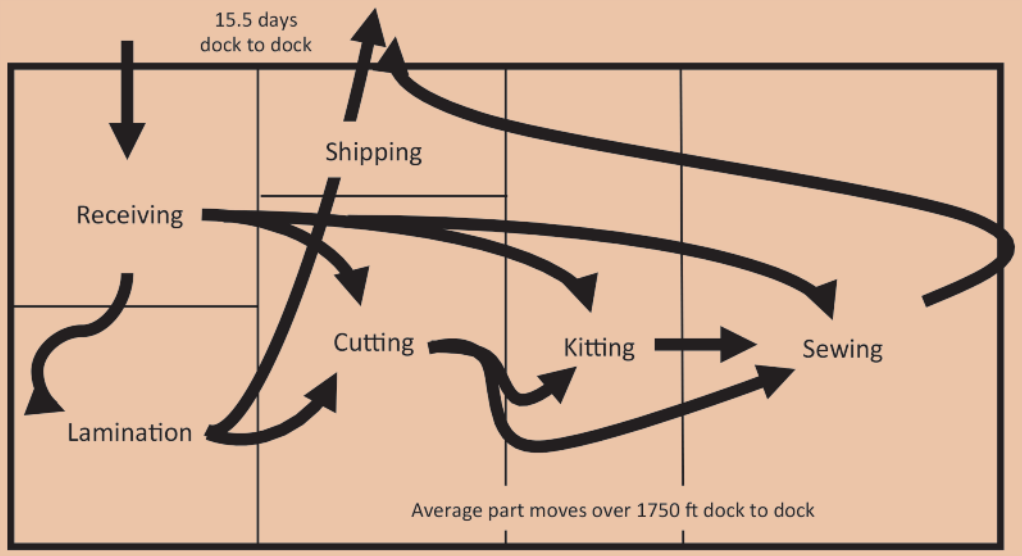
being shipped (see Exhibit 2). Manufacturing lead time dock-to-dock was in excess of 15.5 days and annual inventory turnover was less than 13. Engineering changes and new product introductions (NPI) caused material obsolescence throughout the year. The manufacturing departments had metrics such as labor efficiency, scrap, and overtime. Overheads included salaries for the functional departments, utilities, facility costs, spare parts, indirect labor, and other normal overheads. There were 186 trailers of material in the yard (essentially 50,000 square feet of "rolling warehouse") at $150 per month per trailer, and 50,000 square feet of leased warehouse space offsite were included in the overhead costs.

Profit was projected to decline from 7 percent to just over 4 percent in the next 12 months. Customer expectations for lead time reduction and product quality were increasing sharply, and the competition was aggressively reducing their prices. Two troubling occurrences were the loss of a key customer to a less costly producer and new products having a lower margin than the products they were replacing. In years past, the high revenues and stable margin from this operation had been a steady source of free cash flow and profit for the company, so the projected decline caused great alarm and calls for action.

The products and manufacturing processes were not very complex by themselves, but the combination of the number of parts, products, processes, scheduling, and the constant NPI created a very complex and dynamic system. This included close to a 350,000-square-foot area of manufacturing space, over 3,000 final products shipping just-in-time to a dozen different customers locations, more than 10,000 purchased and internal part numbers, 4,000 employees on a two-shift operation six days a week, and 2,200 machines (1,800 of those being sewing machines). Balancing the enterprise resource planning (ERP), material requirements planning (MRP), scheduling software, Warehouse Management System, and reality with customer expectations required 22 of the smartest and most dedicated employees working every day to check, correct, manage, and expedite the process. These heroes were required in a system that was on the edge, or past the edge, of its capability.

Customer expectations and corporate demands increased, but the capability

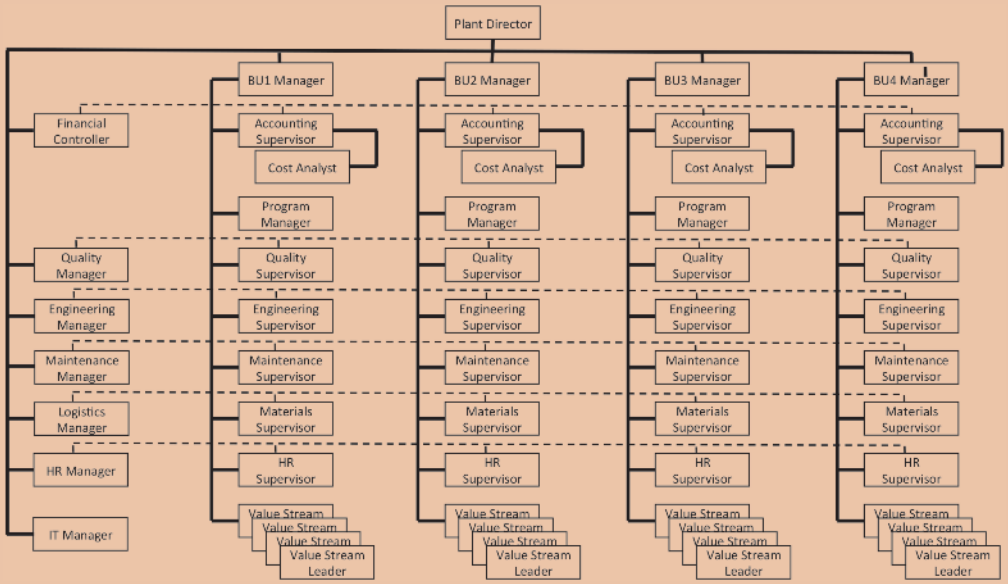
EXHIBIT 2 Plant Layout Organized by Department (BEFORE)



of the processes to manage equipment, inventory, people, quality, and new product introduction did not. The solution was to work harder, and the staff was now working over 12 hours a day, almost every day. Employee turnover, divorce, and workplace stress were increasing rapidly with no end or solution in sight. Management had used Six Sigma, quality circles, incentive plans, bonuses, and several other tools and strategies to improve process performance. Results were achieved, but the rate of improvement was not equal to the rate of improvement demanded by the customers and corporation in cost, quality, and delivery. The point of diminishing returns had been passed, and now herculean efforts produced only incremental improvements. The process was not capable of producing results faster, cheaper, or better.

The stage was set. Everyone was ready to try something, anything, and the senior staff had the leadership and management skills to accomplish the change. The first task was the organizational structure and plant layout. The textbook example of value stream management is to organize by value stream and product families, but this factory had almost all of its products in the same family, and they were made using the same processes. We chose to organize around customers. Each of the four business units (BU) had a focus customer, or group of customers, and then they were further organized as value streams inside the BU based on product type. BU1 had one customer and one ship-to point. BU2 had one final customer and three ship-to points. BU3 was a collection of low-volume and unique products. BU4 was the former lamination department, which supplied all of the internal BUs, some sister facilities, and other customers. BU4 only had three machines and supplied several customers, so they initially could not be aligned with the other BUs until the machines were correctly sized. Changing the type and size of the lamination equipment to produce the correct mix of products at the required volume happened later when it was time to replace and upgrade the existing equipment. The previous process village departments like cutting had 15 machines, which were split between BUs 1, 2, and 3 and were based on required volumes and capabilities. The kitting department was entirely eliminated as flow replaced the batch-and-queue system. The sewing department had almost 1,800 sewing machines (14 different types), which were easy to divide and move to the new BUs.

EXHIBIT 3 Organizational Structure Aligned as Customer-Focused Cross-Functional Teams (AFTER)

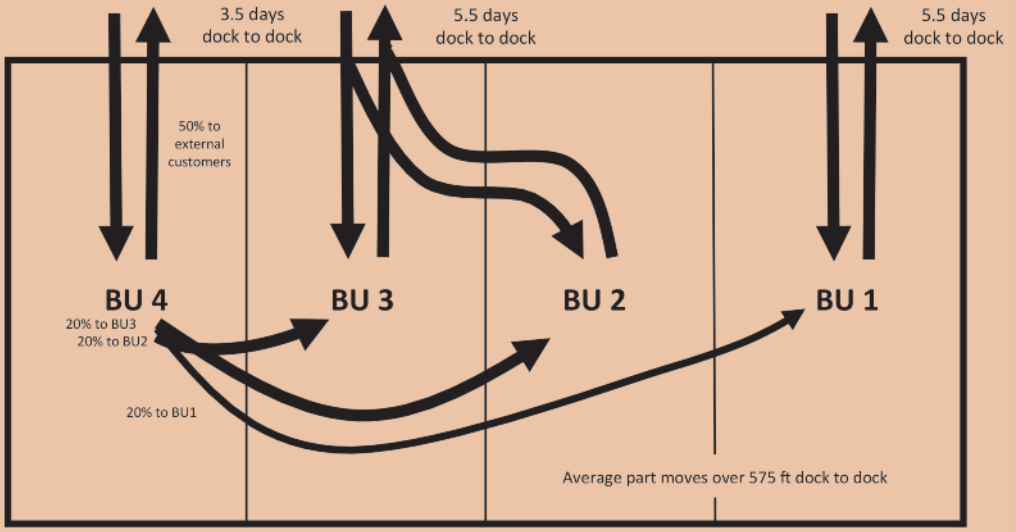


Most personnel from the functional departments were brought into cross-functional teams of operations, program management, quality, logistics, maintenance, and engineering. Some departments, like finance, IT, and research and development, remained as separate departments and reported to the plant director. Accounting remained as a department but would change as we transitioned from one large factory to four factories (profit centers) and some departments (cost centers). Eventually, many of the accountants and cost analysts would have critical business management roles inside the BUs (see Exhibit 3).

Concurrent with the organizational changes were the physical changes to the plant layout and offices (see Exhibit 4). Functional department offices were replaced by the BU team, in the BU area. Production would run Monday through Friday, and on Saturday a few machines would be moved. Sunday would be tryouts and qualifications in the new location, and on Monday the factory would be back in production. This was the schedule for 50 weeks: one year to get the equipment in the proper places for the BUs to have their people and equipment in one contiguous location. A shipping/receiving truck-high dock was added for BU1 so material could flow without having to mix incoming and outgoing materials with all of the other BUs. Change had become the new normal, but the biggest changes still had to occur as we changed the manager's mindset and behaviors from "make parts" to "make money" and the staff's mindset from "make reports" to "make improvements."

Before the changes, the plant manager and his team were working hard to solve the biggest, most difficult problems. The team did not have the capacity or time to work on small problems, so those smaller issues were left to solve themselves or become bigger problems. This was a great team of hard workers with high intelligence who had years of experience. Without this team and its level of dedication, the system would have fallen apart years ago. Now we had four BUs, with each able to address cross-functional problems and to focus on a few customers instead of many different customers. With the problems now decoupled from the larger, more complex system, the problems were simpler and faster to solve. The reduction in complexity allowed employees to see and understand cause-and-effect relationships in

EXHIBIT 4 Plant Layout Organized by Value Stream and Business Unit (AFTER)



hours or days that previously would have taken weeks or months, and often these problems were too complex to even attempt a remedy.

With material and products now flowing through their processes instead of all of the processes, and now that they only had to travel through their area instead of the entire facility, inventory turns increased from less than 13 to more than 25. Shorter distance to travel led to less handling and less storage; less handling and storage led to improved quality and less obsolescence. The area previously used to store, kit, and move materials was now available to reduce the number of trailers in the yard. Less trailers resulted in improved inventory turns and inventory accuracy and less obsolescence. Problem solving and problem prevention was happening at a rate approaching 10 times that of the old system.

Accounting began providing business reports to the BU managers so that they could manage their business, not just manage production. First, we started to give cost and revenue reports to each BU manager. Revenue reporting was easy, which could be found by the quantity of each part number shipped multiplied by the price to the customer. Costs included direct materials and spare parts, all of which were straightforward because the BU had almost no shared direct parts. Machines were assigned to a BU, as were their costs. Both direct and indirect labor was assigned to a BU so that the labor costs were attributed, and managed, by the BU. Indirect materials, such as oil, grease, rags, and other maintenance, repair, and operations (MRO) costs, required some tracking mechanisms to ensure that they were assigned to the correct BU. Separate utility meters were installed so that when a BU used electricity, natural gas, or other resources, it could understand and manage its costs. The goal in cost reporting was to accurately identify the resources that BUs used and to see the total cost to produce the BUs' product lines without the confusion of allocations, averages, or variances. The plant director was responsible for a cost center to account for costs that could not be attributed to individual BUs.

The typical reports were a plant profit and loss statement (P&L), a 13-month rolling annual budget, and reports showing the variance, by line item, of budget to actual. Cost analysts would generate reports to show why a variance had occurred and action plans to correct negative variances and sustain positive variances. These reactive reports were based on anecdotal evidence and statements gathered from managers one to

three months after the events. No one truly understood what the variances meant, but luckily no one believed the reports that the variances generated.

The financial reports for the plant to the corporation remained unchanged, but how they were prepared was very different. P&Ls, budgets, and financial reports were prepared for each BU and cost center, and the sum was rolled up to produce them for the plant. Actual costs, not estimates or percent allocations, were assigned to the actual BU that used them. Managers that had 15 to 30 years of experience managing to meet metrics like efficiency and throughput were now challenged to reduce total costs while meeting customer expectations for quality and delivery. Decisions on machine changeover, production schedules, and overtime that had been driven by the impact of units per hour, scrap, and earned hours now were balanced by customer orders, quality, carrying costs, and available area. Cost analysts were assigned to BUs and were studying actual costs and processes in order to make changes in real time to positively influence the actual costs. Reactive reports were now proactive recommendations and actions based on firsthand observations and real-time data.

BUs began saving money in ways that the plant never had and in places that had never been imagined, including the following:

- Area reduction to save BU rent opened up several thousand square feet for new business and led to a reduction in external warehouse and trailers;
- Turning off lights and installing motors that turned off instead of idling reduced electricity costs by over 20 percent;
- Faster flow and dedicated cutters reduced the total number of machines needed and allowed for the cancellation of three new machine purchases;
- Direct headcount dropped 10 percent as the BUs focused on highly skilled, cross-functional employees;
- MRO costs dropped as BUs found ways to repair machine parts instead of replacing them;
- Labor hours were spent on preventive maintenance instead of downtime maintenance;
- Overtime became the exception instead of the rule;
- Excess and obsolete inventory was now visible and reduced or avoided; and
- Instead of using potable water for industrial, sanitary, or landscaping purposes, gray water was used at a fraction of the cost.

Dozens of small projects and experiments to optimize equipment, layout, path, and work were now possible because the focus was on running for one customer's requirements and not the complexity of trying to satisfy every customer's design, quality, and delivery requirements. Improvement in the past had focused on a few high-payoff projects. Now the BUs, value streams, and individuals were focused on implementing thousands of small improvements. Everyone in every area or function improving every day is real, continuous improvement.

Improvements in program management and new product introduction were critical to customer satisfaction and overall business success. A product that does not start correctly usually has quality, cost, and delivery problems throughout its life cycle. NPI had traditionally been a source of cost overruns and crises both internally and to the customers. Improved communication and the one-customer focus of the cross-functional teams allowed for the launch of new products on time, on budget, at rate, and with fewer problems.

The team knew where they were, and we created a vision of where we wanted to be and what we wanted to be. They closed the gap from where we were to where we wanted to be with a series of learning loops and experiments. Without knowing from exactly where the cost savings would come or what steps we would need to take to get from the current to future state, no budget could be planned and no return on investment (ROI) could be formulated. There was no ROI plan or budget for this transformation. We had a vice president who understood lean and a management team that could lead. We

used the spending limit of the plant manager to make the first step, we learned what worked and what did not, and we proceeded from there. Savings and efficiencies from the first steps gave us the money we needed to take the next step. We did not know where the savings would come from, but we knew they would come. The transformation was based largely on faith and the fact that every other option had been tried. It took 50 steps at $10,000 each, one per week, to align the physical flow and the organization. It took a second year to move from operating the BUs as production units to operating them as businesses with financial reports and metrics.

The complexity of trying to coordinate a dozen different departments was replaced with four BUs. The complexity of managing an inventory with tens of thousands of part numbers in dozens of places as it moved through a batch-and-queue system was replaced with four businesses managing a few thousand part numbers. Each had one location and flowed through the system. Creating a budget for a factory with dozens of customers, each with varying demands, volume fluctuations, and pricing schedules, became five budgets rolled into one, and each of those five budgets was focused on the variables of one customer. Allocations were almost eliminated as actual costs were accounted for by the business that accrued that cost, sometimes even on a daily basis. Managing by variance to budget or variance to standard was replaced with management of total actual cost.

Results after one year included:

- the elimination of $1.3 million in excess and obsolete materials;
- a $300,000 reduction in customer chargebacks;
- a 10 percent reduction in total headcount lost through attrition and not replaced (no layoffs);
- a $200,000 reduction in trailer fees and external warehouse space;
- 7,000 square feet of area opened for new business;
- the most successful launch of a major new product line in recent memory; and
- new business from the customer that had left for a less costly supplier.

We were now the least costly supplier with the highest quality, but also the best profits. Profit had recovered and was trending upward, but much more time, effort, and leadership were required to make this the new norm and not slide back to the way we had been comfortable with for so many years.

Returns were achieved after just four months, but we could not predict where the cost reductions were occurring nor how much we would save. The results were good news but caused concern because we were not able to forecast and budget the savings. Some savings were one-time events, such as reductions in external warehouse costs, but others, such as improvements in scrap and less expedite charges, were difficult to predict as we were uncertain if would see them every month or not. It took almost two years to create a stable system that was able to continuously improve at a predictable rate and consistently deliver bottom-line results that could be predicted and planned. This was not a silver bullet solution; it was hard work and experimentation combined with detailed processes and a culture of self-discipline to continuously improve.

It was tempting to stop once the margin had improved back to the previous 7 percent level. Instead, the drive continued and an 11 percent margin was achieved. Many layers and types of complexity and overprocessing had been eliminated and reduced. Barriers to communication, teamwork, and focus on the customer had also been removed. Process, organization, and reports were aligned to provide the appropriate information to the right people at the right time so they could act accordingly for the customer and the company. The combination of high revenues and high margin made this factory the cash cow of the corporation. Best of all, the methods created by the factory were repeated in other factories and served as a model for even greater successes at other locations. ■