

WHITE PAPER

TARGETED IMPROVEMENTS
CAN PRODUCE
SYSTEM-WIDE TRANSFORMATION

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Introduction

With all we hear about the latest and greatest manufacturing technology and techniques, we still need a solid understanding of the basics to intelligently use the tools available to us. Varied terms like *Flow*, *Lean*, *Kanban*, *ERP*, *APS*, *CRM*, and *ecommerce* continue to appear in industry magazines and news stories—but the basic principles for achieving productivity improvement remain constant.

Many approaches are available for reducing cycle times, leaning inventories, and improving quality and delivery. Used individually, these approaches to productivity improvement may have a tactical effect. But used in concert, they can be part of a targeted, strategic plan for improving profitability, performance, and delivery throughout your organization. Used properly, these techniques can help produce a positive, system-wide transformation.

Increasing Speed, Flexibility, and Profitability

The role of business, any business, is to serve its customers—and to make a profit at the same time. While elimination of waste and cost reduction are part of the equation, revenue creation is the major driver of profit. The compounding benefits of per-unit cost reduction will not result, if the volume of units shipped does not increase. By increasing throughput, you will experience a healthy combination of cost reduction and profit improvement as a result of increased overhead absorption. The key question is, “How do I drive the largest amount of revenue over my asset base?” This is the most effective way to generate profit and keep a business healthy. Speed and flexibility in revenue creation are the cornerstones of success in today’s business environment.

Constraints-based analysis tells us how and where to apply the techniques that result in maximum organizational improvement. The first step is to determine what component of the system is causing output to be reduced (this could be a machine, a policy, or other resource constraint). By focusing on bottleneck areas that are restricting system

throughput, you can develop improvement initiatives that have the greatest positive effects.

In some cases, outsourcing to a *virtual asset* can help you increase utilization and revenue throughout your whole system. A virtual asset could be a supplier you have partnered with to supply a guaranteed amount of a part or subassembly, which would normally go across your constraint. This approach effectively increases capacity at the bottleneck resource and focuses on increasing system throughput. At the same time, you should be continually focusing on reducing ongoing operating expenses and decreasing investment (for example, inventory) that does not contribute to throughput. A core principle to follow is this: Pay attention to the system as a whole, rather than to its local components.

Proven Techniques for Improvement

Operations people often hear about the rising labor costs that go along with more complicated product designs. Or that material rejects and waste, due to fit issues, are affecting cost and on-time measures. Let's look at how flexible organizations target these sorts of issues and at the same time make improved execution and profitability a reality. Using the techniques described below will help you answer important questions like, "What is the single biggest driver of product cost?" and "What has the biggest impact on material and labor costs?" The following productivity-improvement techniques also will enable you to intelligently solve vital challenges relating to your inventory levels, cost of quality, and resource capacity.

Design for Manufacturing and Assembly

The first approach, *Design for Manufacturing and Assembly (DFMA)*, is a technique that addresses part counts, process specifications, tolerances, assembly labor, and quality costs. Product design determines 80% to 90% of a product's cost. This cost is built in before the design ever hits the production floor. Design affects the number of new parts

that are created; material and process specifications and tolerances; the resources that the designed process consume (labor, material, and equipment capacity); field service issues; and the depth and breadth of inventory all across the supply chain.

Organizations should question designs that use constraint resources that already are challenged at current production levels (critical materials, critical labor, and critical equipment). Sales, Manufacturing, Purchasing, and Engineering should be sensitive to the impact that a particular design has on the organization as a whole, and they should work together to optimize a design solution.

Product Family/Product Mix

A second approach that addresses processing is *Product Family/Product Mix* analysis. By grouping products into similar process streams, you can explore scheduling techniques relating to work cells, part standardization, and set-up. For each product, you also will want to examine revenue contributions generated across bottleneck resources (dollars generated per time unit). Looking at a system's ability to generate revenue, rather than managing strictly to margin, you can better understand how to effectively deploy marketing, commission, incentive, and capital plans.

Part Standardization

A third approach, *Part Standardization*, relates to material and inventory costs. *Part Standardization* has larger implications when combined with *Design for Manufacturing and Assembly* and *Product Family/Product Mix* as described above. Here is an example of standardization as related to part design:

Scenario 1

The first scenario involves a part that is designed to be used in multiple applications (let's assume eight), by clipping right or left corners, and applying different sets of hole patterns, some of which are common to all. The forecast for end items creates

dependent demand for some quantity of each variation. Items are run in multiples on a standard size sheet. These could be run to a two-bin Kanban, using the empty bin as the signal to produce, while storing the inventory at the point of use. Or worse yet, we could create work orders for each of the eight variations, and produce to forecast quantities. In either case, we have created some level of inventory of eight discrete items, which is subject to specification revision, quality problems, or obsolescence risk. We are always over or short on individual parts due to forecast error of the individual end items. Consequently, we incur additional raw material and set-up costs to balance the supply to actual demand. Does this sound familiar?

Scenario 2

In the second scenario, we make a standard part with no clipped corners and all the standard holes. We again use a two-bin Kanban, using the empty bin as the signal to produce, and store the inventory of a standard part at the point of use. But now instead of 16 bins of inventory (8 x 2), with the associated material, labor, and set-up costs, we have just two. By using quick set-up tooling and a dedicated machine located in a work cell, we can convert the standard part in a lot size of one, based on real demand for each variation. That way, we do not commit standard part inventory, until the last possible moment.

As you can see, part standardization can be a powerful design approach that is important and far-reaching. In addition, we have minimized risk resulting from specification revision, quality problems, or obsolescence. We also no longer need the raw material inventory to cover for forecast error on eight items. The aggregated forecast is more stable. Inventory in the supply chain as a whole has been reduced.

Constraint Resource Management

A fourth approach is the use of *Constraint Resource Management* and protective inventory buffers (as developed by Eli Goldratt in his “Theory of Constraints”). Time lost

at a bottleneck is not recoverable, and it affects the ability to maximize throughput over the asset base. All bottleneck operations in the supply chain should be protected against disruptions in supply by the use of a finite buffer of inventory, which is waiting to be worked on. Keeping inventory at other than protective buffers is wasteful.

The excess capacity at a non-bottleneck resource is capable of responding to signals for production—without keeping inventory. Therefore, when the buffer in front of the bottleneck is full, there is no need for the feeding operation(s) to produce. Managing to these supply buffers dictates the pace of each supply stream. Using process-improvement techniques to improve performance at the bottleneck, or actually removing the supply-stream bottleneck by redesign of the product, quickens the pace of the total system. Continuous improvement of the system bottlenecks perpetuates this quickening.

Cross-Training

A fifth approach, *Cross-Training*, addresses the labor resource. This again involves response to real demand and the pace of the supply stream. The pace of buffer movement dictates production at each point in the supply stream. Non-bottleneck labor should be matched to the pace of the bottleneck resource. Supporting labor resources will be underutilized, if they are not cross-trained to flex with the needs of the supply stream.

Pull Processing

A sixth approach is the application of *Pull Processing* techniques, such as Lean Manufacturing, which facilitate the recognition of real demand *versus* scheduled demand. You may delay revenue opportunities, or lose them entirely, by making decisions based on apparent capacity *versus* real capacity.

If operating in an MRP II environment, work-center scheduling is based on customer orders; forecasted demand; inventory policy for minimum balances; and safety stock

requirements. MRP masks the part of the production schedule that is needed to generate immediate revenue. Rather than strictly following the MRP dispatch lists, procedures must be implemented that recognize the real demand and give it priority in the supply stream.

Information Technology

A seventh approach is the tailoring of information-technology tools to accommodate the process in question. You want to ask yourself, “Which information-technology tools do I apply, and where do I apply them?” Have your business processes been sufficiently simplified to make data from information-technology tools—like ERP and MRP—more accurate and meaningful? Or are you buried in meaningless detail that is frequently wrong?

Finding Opportunities for Improvement

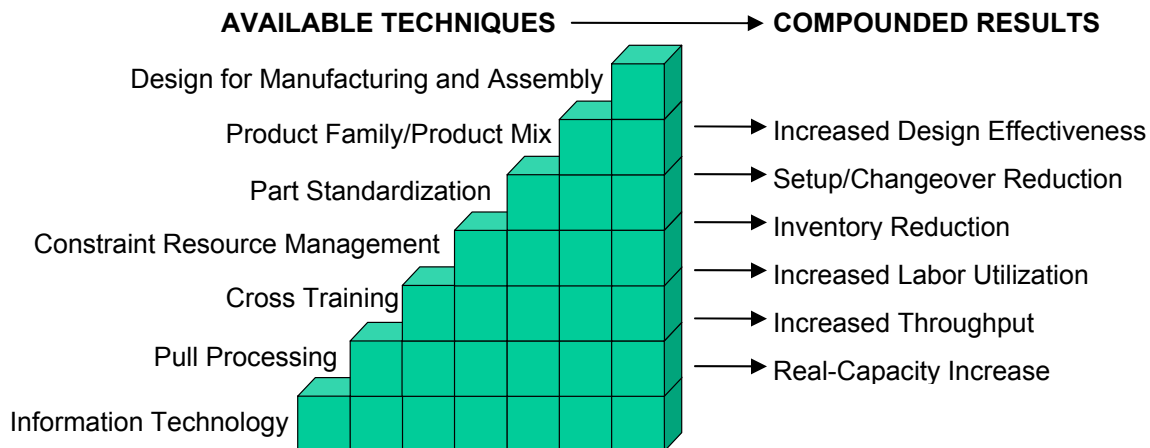
Begin looking for productivity-improvement opportunities by examining the following areas:

1. Question existing policies relating to margins, batch size, and revenue.
2. Develop an effective revenue growth strategy.
3. Formalize a Continuous Improvement philosophy, and focus your solutions on the constraint path.
4. Standardize! Standardize! Standardize! Common parts and their variants play an important role in inventory reduction. Development of part- and process-optimized designs leads to improved inventory performance.
5. Ensure that your company’s culture and functional disciplines provide timely and accurate data, so that you can use your information-technology tools effectively.

Compounding Your Results

All of the productivity-improvement techniques discussed above can be effective when used individually. However, the layered effects of these techniques, working in concert,

are more powerful and far-reaching than any single example can demonstrate. Think about these techniques in the context of your own business and how they can be applied most effectively. Also consider other techniques that could make sense for your organization.



Continuous Productivity Improvement

After initiating your productivity-improvement program, you will want to ensure that your organization continually makes your system even more responsive and flexible. System responsiveness and flexibility enable you to employ productivity-improvement techniques in optimal ways—leading to more operational efficiencies, better performance, greater profitability, and the system-wide transformation of your operation.

LEWIS C. CADKIN BIOGRAPHY

Lewis “Lew” Cadkin has over 30 years of manufacturing experience in roles ranging from Consultant, to Design Engineer, to Vice President of Manufacturing and Engineering. He has helped develop balanced, common-sense approaches to implementations of Lean Manufacturing and constraints-based manufacturing strategies. He also has implemented integrated software systems for a number of companies.

Mr. Cadkin has held senior-level manufacturing and engineering positions in various industries, such as Lighting Fixtures, Plumbing Products, Building Products, Toys, Bedding and Furniture, and Automotive Seating. He has experience in many fabrication and assembly-oriented processes, including wood and metal fabrication, machining, assembly, painting, plating, and urethane foam processing.

He holds a Master of Management (MBA) in Operations Management and Management Information Systems from Northwestern University; and a Bachelor of Arts in Design from Southern Illinois University. He also is on the Board of Directors of the Milwaukee Chapter of APICS and is a NIST/MEP facilitator in “Principles of Lean Manufacturing” and “Value Stream Mapping.”

Currently a divine, Inc. Senior Consultant, Mr. Cadkin helps organizations identify policies and processes that are limiting their ability to create value, and he also teaches organizations to focus their efforts on improvements that will achieve bottom-line results.

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