The Art of Lean Program Management

By Robert Spector and Mary West

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Tired of spinning your wheels on lean, Six Sigma, and other improvement projects that go on and on while producing preciously few results? Then you may want to put in place a business discipline called lean program management. Essentially, it's the art of applying the principles of lean, Six Sigma, and constraints management to the actual management of those improvement projects.

Currently, the two most popular business improvement programs are lean and Six Sigma, which increasingly are being combined into an approach called lean/Six Sigma. But many organizations' long-term efforts to apply those programs are running into difficulty. In many cases, these programs are running out of momentum—and in some cases, they have actually ground to a halt.

On the face of it, such difficulties are hard to imagine. After all, Six Sigma drives improvements in quality and reliability by reducing variation using a problem-solving methodology known as "DMAIC" (define, measure, analyze, improve, and control). And lean focuses on eliminating waste in new product development, manufacturing, and distribution in order to cut lead times and investment, increase flexibility, and reduce costs. Lean involves using as little as possible of the available resources—including time. What's not to like about lean or Six Sigma, and what could go wrong with them?

Plenty, as it turns out. Despite the increasing popularity of Six Sigma as an effective improvement methodology, many Six Sigma projects fail to deliver the expected results.[1] Similarly, some observers maintain that the vast majority of companies that have launched lean implementations have failed to see sig-

nificant financial results.[2] These problems are not isolated to lean and Six Sigma initiatives. According to one study, 43 percent of performance improvement initiatives undertaken from 2002-2005 by the companies surveyed failed to achieve the strategic business and financial objectives that the initiatives were designed to support.[3]

Another problem is that these programs are seen as taking too long to produce meaningful results. The most often-cited complaint about Six Sigma is the long project cycle times.[4] It is estimated that most projects last six to nine months or even more[5]—an obvious opening for lost opportunity cost. (A project that yields $25,000 per month in improvements leaves $150,000 on the table when it takes ten months versus four months to complete.) Yet quite a few organizations have begun programs that take years before they see big improvements. The fact is most companies invest in improvement programs expecting to see fast and sizable changes. When the competitive landscape changes so quickly and dramatically, they simply cannot wait months or even years to see benefits.

As explained in an earlier issue of *Supply Chain Management Review* (see "How Constraints Management Enhances Lean and Six Sigma," January/February 2006), many implementers of lean and/or Six Sigma programs find themselves faced with too many projects that take too much time with too little benefit. They spread their resources thinly rather than concentrating on the key levers—or constraints—of the organization. Managers complain that they don't know which projects are "important" and which aren't. Aggravated by lengthy implementation times, the sheer project volume has led to "project fatigue," as managers get anxious about seeing results and worry about doing their "day jobs" well. Things only get worse when overextended projects are killed and replaced by new ones that eventually meet the same fate. Disillusionment and poor participation rates are not far away.

Several progressive companies have found a way out. They are utilizing a discipline that the authors call "lean program management" (LPM). LPM encompasses both strategy and execution. Essentially, it calls for applying lean and other improvement principles to project selection and execution

themselves. Executed correctly, project selection can pave the way to a high return on investment, sustained leadership commitment, and long-term success. According to Larry Bossidy, author and former chairman of Allied Signal and Honeywell, "Execution is the missing link between aspiration and results." Picking the right projects doesn't matter if you are unable to execute them successfully. This article will detail the principles of the LPM approach as applied to both project strategy and execution, including several examples from successful companies.

Examining the Strategic Context

Let's assume, for simplicity's sake, that the improvement programs are lean/Six Sigma (LSS). It is important to examine the strategic context for lean program management. We have identified five prerequisites:

Prerequisite 1: *Improvement programs must align with the company's strategy and objectives.*

Too many companies push "pet" projects instead of allowing business needs to drive project selection. As a result, key staff members do not work on the projects that bring the most value. To avoid this problem, the company's executive leadership must define the objectives of any lean/Six Sigma program and communicate them clearly and consistently throughout the organization prior to launching the program.

Many successful programs are based on a "burning platform," or a major business challenge that the company can overcome only by applying LSS. An example of a burning platform might be a need to retain customers or to introduce new products or services faster than the competition. By identifying a burning platform, the company ensures that every business leader is clear about why the company is adopting LSS principles. It is fundamentally important that the CEO and other executives speak with one voice about that platform.

Another technique for aligning Six Sigma programs to corporate strategy is a discipline called policy deployment or *hoshin-kanri*. Bank of America has excelled at using this alignment discipline to plan and execute its Six Sigma program.[6] Policy deployment ensures that all of a company's constituent parts face in the same strategic direction. For the planning phase, Bank of America executives named the most important strategies and communicated them over three pages. The first page covered the "what"—the vision, mission, goals, and the three-to-five-year breakthrough strategies. Page two dealt with the "how"—the 12-month tactical plan and key performance metrics. And the third page addressed

the balanced scorecard—the performance measures that the company needed to track monthly progress against its benchmarks.

These performance metrics must be clearly defined by senior management. Without clearly defined success measures, it is impossible to have projects finish on time or to anyone's satisfaction. It is important to "begin with the end in mind," as author Stephen Covey prescribes.

Projects that don't align with a company's strategy can also hide significant employee-engagement issues. For example, if employees are told that the organization wants to improve customer service, but they learn that their improvements are being used to reduce headcount, you can forget about being successful with your improvement program—now or ever. The important point is to be honest and clear with employees about the program's rationale.

Prerequisite 2: *Top management must be committed and actively involved.*

Results of a recent survey published on the *iSixSigma* Web site show that 60 percent of respondents cited "lack of sustained executive sponsorship and commitment" as a key factor in why Six Sigma projects fall short of expectations. It is all too easy for senior managers to pay lip service to improvement projects. When there is a lack of true buy-in from the top, project selection is at risk of failing to address critical business needs. If the improvement projects selected are not considered business priorities, managers will not be engaged, and the projects will not get the attention, commitment, and resources they need to be successful.

When there is a lack of commitment and buy-in from the top, project selection is at risk of failing to address critical business needs.

The reason is simple: Six Sigma and lean involve making changes to major business processes that cut across organizational barriers. To be successful, improvement efforts cannot be led by anyone other than top management—specifically the CEO—whose authority reaches across those barriers. It is highly unlikely that Six Sigma would have succeeded at General Electric without Jack Welch's say-so or at Allied Signal without Larry Bossidy's steadfast leadership and commitment. Welch demanded that employees be "lunatics" about quality, and he made Six Sigma a major criterion for incentive compensation and promotion. Enthusiasm spread from management to the entire workforce.

To secure senior management's involvement, an executive steering committee should oversee the deployment of the improvement program. That committee can ensure that goals are set, priorities are agreed upon, projects are properly selected, resources are made available, and results are tracked against expectations.

Prerequisite 3: *Projects must be focused on a growth strategy.*

Constraints management (CM) posits that for any for-profit company, the goal is to make more money. The three global measurements to determine progress against that goal are: throughput (the rate at which the company makes money through sales); inventory (the amount of money captured within the company at any one point in time including the value of materials, parts, and assets); and operating expense (the rate at which the company spends money to convert inventory into throughput, that is, the costs of doing business). While improvement programs should attempt to simultaneously increase throughput (sales minus all totally variable costs), decrease inventory, and decrease operating expense, the main focus must be on improving throughput.

Companies that focus on throughput gain an advantage over competitors that are preoccupied with operating-expense or cost-reduction projects. Costs are everywhere: The companies that aim their improvement projects at cost-cutting will end up spreading their resources too thin and prolonging project-completion times.[7] Constraints management, however, posits that there only a very small number of areas (constraints) in a company that limit significantly higher levels of throughput. Focusing efforts on improving throughput allows the organization to focus its resources in the areas that will drive maximum value. Further, growth is all upside, whereas cost-cutting is finite. Realizing this, companies such as disk-drive maker Seagate Technology have decided to change the measure of their Six Sigma efforts from cost saving to increasing throughput.

Moreover, a goal of cost-cutting will encounter considerable resistance from employees fearful of losing their jobs. Why would employees be willing to help with "improvement efforts" if these translate into their jobs being lost? Likewise, there will not be any rush to complete projects promptly if job cuts are the anticipated result.

Prerequisite 4: *Take an enterprise approach to program management.*

Constraints management states that improvement efforts should be focused on the weak links of the organization—the constraints. In keeping with this philosophy, lean/Six Sigma projects should target improvements to those weak links. Trying to improve links that are already strong is simply a waste of time and resources. LSS programs achieve greater results by harnessing CM. Here is one example: A global electronics contract-manufacturing company conducted a study of 21 of its plants that had implemented lean, Six Sigma, or LSS/CM. The study revealed that those plants that had taken the combined approach contributed 89 percent of the total benefits achieved. Six Sigma by itself came in a

distant second with a 7 percent contribution followed by 4 percent from lean applications alone.[8] When Seagate used constraints management to help focus its Six Sigma projects, the drive maker saw its improvement projects finish much faster, with significantly higher rates of project completion.[9]

Prerequisite 5: *Establish a cross-functional, process-focused infrastructure.*

Several observers have noted that one of the top reasons why an implementation fails is the company did not establish the proper infrastructure for its improvement program.[10] A cross-functional, enterprisewide program management office (PMO) addresses this issue. It's imperative that the PMO be cross-functional so that LSS projects are focused on improving processes or value streams rather than on local department objectives.

When such projects are driven by departments, the results can be devastating. At one company, lean improvement projects were selected by department. In this case, the purchasing department conducted a sourcing project to reduce the costs of raw materials—specifically ball bearings. The purchasing teams found a way to reduce the material cost sharply by procuring the bearings from Asia rather than from a local provider. But they neglected to factor in the dramatic increase in lead times, which caused some stockouts on the shop floor. Consequently, the company lost some customers and came close to going out of business.

To establish this cross-functional PMO, a company needs to be a process-focused organization as opposed to a functionally focused one. A process-focused organization is characterized by being customer-focused and having companywide prioritization. Johnson & Johnson (J&J) has been successful in doing so as part of what its leadership calls "process excellence." In such an organization, projects are deployed from the cross-functional PMO rather than by department. Concomitantly, it is vital that key stakeholders in the process clearly understand the purpose and scope of the project before it starts—and that those stakeholders have the authority to approve solutions when necessary. To facilitate this, leading companies like J&J assign processes to individuals known as "process owners." These owners are responsible and accountable for the process's performance, measured by such metrics as quote-to-cash, procure-to-pay, plan-to-fulfill, and issue-to-resolution.

The LPM Implementation Steps

So what does it take to put lean program management into action? There are six key steps:

Step 1: *Prioritize projects based on their impact and use of strategic resources.*

The cross-functional project management team should prioritize projects by balancing the estimated benefits versus the effort involved. A project's impact should be estimated in terms of its global impact (considering throughput, inventory, and operating expenses) rather than by traditional measures, which typically end up being cost-accounting mirages.

The "effort" part of the equation should be measured by how much of the company's strategic resources—in particular, its people—are consumed by the project. The project pace is dictated by the most capacity-constrained resource. For example, if one key resource person is on several projects, the projects' pace will be determined by that person's availability and pace. Overutilization of key resources will almost always put the brakes on projects. It's crucial, therefore, to identify the right project team and structure to avoid

EXHIBIT 1

Real-world Payoff of CCPM

Company	Before CCPM	Results After CCPM
High -Tech New Product Development HP Digital Camera Group	• 6 cameras launched in 2004. • 1 camera launched in spring window. • 1 out of 6 cameras launched on time.	• 15 cameras launched in 2005, with 25% lower R&D expenses. • 7 cameras launched in spring window. • All 15 cameras launched on time.
Home Appliances New Product Development Hamilton Beach/ Proctor-Silex	• 34 new products per year. • 74% projects on time.	• Increased throughput to 52 new products in 1st year, and to 70+ in 2nd year, with no increase in headcount. • 88% projects on time.
ASIC Design Technology Development LSI Logic	• 74% projects on time for small projects; major tool releases were late.	• Due-date performance increased to 85% projects on time; major tools released on time for three years in a row.
Submarine Maintenance and Repair U.S. Naval Shipyard, Pearl Harbor	• Job completion rate = 94%. • On-time delivery < 60%. • Cost per job was $5,043.	• Job completion rate increased to 98%. • Increased on-time delivery to 95+%. • Reduced cost per job to $3,355, a 33% reduction; manning dropped by 25%. • Overtime reduced by 49%, a $9M saving in first year.
Automotive Product Development DaimlerChrysler	• Cycle time for prototype builds was 10 weeks.	• Cycle time for prototype builds is 8 weeks. • Delivery date performance increased by 83% with much less firefighting.
Electrical Power Transmission, Engineer-to-Order ABB AG, Power Technologies Division	• 72 sales projects completed per year.	• 171 sales projects completed per year. 52% increase in throughput dollars.

Source: 2nd Project Flow Conference, Chicago, Ill., Sept. 8-9, 2005.

burnout from overutilization. Not proactively dealing with the interactions between different projects greatly increases the risk of project failure. It's vital to identify the organization's strategic resources and to have the PMO use this information when prioritizing projects. In one case, an organization had launched a high-priority pilot project to implement lean/Six Sigma. The involvement of several key employees was critical. Unfortunately, those staffers were already assigned to several other concurrent "high-priority" projects. It didn't matter how long and hard the other team members worked; the project took far longer than it would have had the organization properly prioritized projects by factoring in the impact on strategic staff resources.

Step 2: *Use "critical chain project management" to plan and execute projects.*

Well-regarded and well-publicized studies on traditional project management methods by the Standish Group and others show that only 44 percent of projects finish on time.[11] The studies also show that projects are usually completed at 222 percent of the duration originally planned and 189 percent of the original budgeted cost. At the same time, 70 percent fall short of their planned scope, and 30 percent are canceled before completion.

Such appalling statistics can be avoided by using an approach known as critical chain project management (CCPM). CCPM was introduced in 1997 by Eli Goldratt—the creator of constraints management (also known as the Theory of Constraints)—as a new approach to plan and execute projects "in half the time, all the time." CCPM benefits all project stages, from selection through execution and com-

The Critical Chain Project Management Approach

The critical chain project management (CCPM) approach comprises the following elements. (See chart below.)

• **Remove unnecessary "safety" time from project task estimates.** Use the mean task duration (or one that has a 50-percent probability of being successful). Typical estimates of task time contain a large degree of safety buffer time. However, because of Parkinson's Law (work expands to fill the time available) and the Student Syndrome (people waste safety time and start tasks at the last minute), this safety time actually expands the project time.

• **Identify the critical chain.** This is the longest chain of tasks when you consider both task and resource dependencies. It is not to be confused with the critical path, defined as the longest chain of tasks based only upon task dependencies. CCPM recognizes that a delay in resource availability can delay a schedule just as much as a delay in dependent tasks.

• **Protect the due date by buffering the critical chain.** Hitting the project due date is still crucial. But safety time is now moved to "the project buffer." This buffer comes at the end of the project, after the last critical chain task, where it will help rather than hinder the project's on-time performance. Typically the project buffer is 50 percent of the length of the critical chain tasks. In effect, we have reduced the total safety time hidden in the individual critical chain tasks and placed some of it in reserve.

• **Add buffers to noncritical chains that "feed" the critical chain.** The critical chain is still exposed to overruns from noncritical chain tasks that link to it. CCPM protects the critical chain against overruns on these "feeding chains" by inserting a buffer at the point where the feeding chain intersects with the critical chain.

• **Schedule tasks for "late" starts.** In traditional project management, tasks are scheduled as soon as possible after the start date. With CCPM, tasks are scheduled to start as late as possible based on the target end date. There are many benefits to delaying work as late as possible. You minimize work-in-progress and do not incur costs earlier than necessary. Also, there is better focus at the start of the project simply because there aren't as many tasks scheduled to begin.

• **Adopt a relay race mentality and discourage multitasking.** Traditional project management approaches end up assigning people to work just a portion of their time on several tasks simultaneously. Thus, all the tasks take longer, causing the project to end later and inviting more quality problems. CCPM uses a relay race metaphor to put the focus on one task at a time. Each "runner" capitalizes on an early finish by the preceding runner; a fast leg can offset a slow leg to the team's benefit. Applying this approach to project management means that when one task is close to completion, the next task's resource must be on the track and ready to go. It takes the emphasis off scheduled start and finish dates and puts it on triggering preparation based on the preceding task's progress. No task should start earlier than scheduled, but once started, it must be finished as fast as possible.

Critical Chain Project Management at a Glance

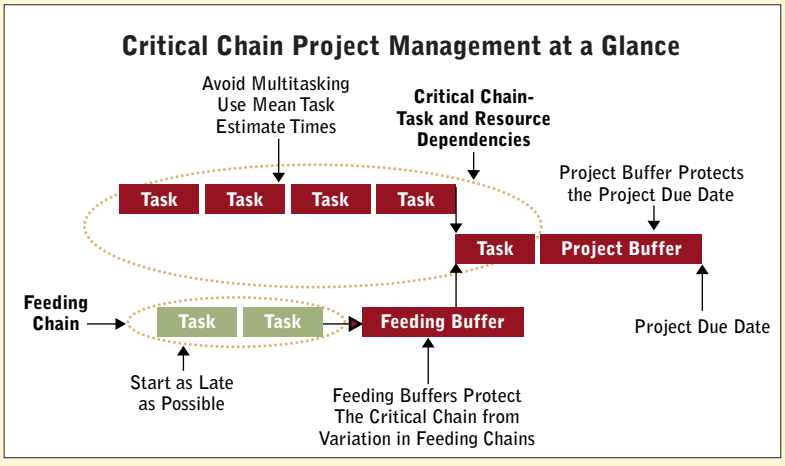
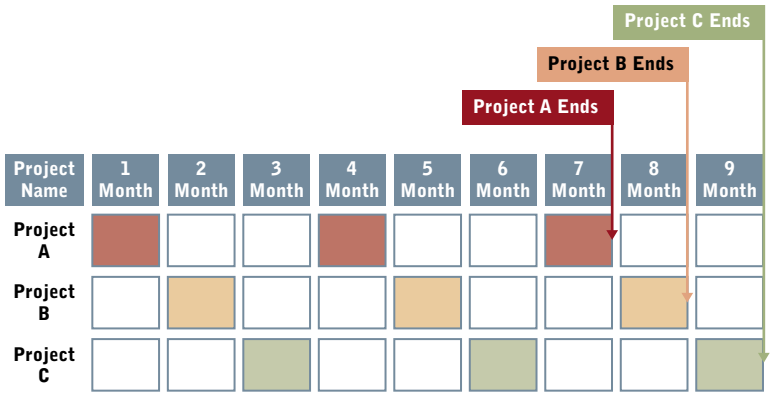


EXHIBIT 2

The Problem with Multiple Parallel Projects



pletion, by combining key elements of lean thinking, constraints management, and Six Sigma. (For more information, see the accompanying sidebar on "The Critical Chain Project Management Approach.")

Companies using this technique have reported the following: 95 percent on-time and on-budget completion rates; reduction of project duration by 50 percent or more; increases in project completion rates of up to 100 percent; enhanced project delivery success in terms of scope, cost, and schedule (to nearly 100 percent success); and reduced stress on project teams.[12] (Exhibit 1 summarizes how several example companies across a range of industries fared before and after implementing CCPM.)

Step 3: *Minimize the number of concurrent projects.*

Given that most companies want to generate significant results from their improvement programs as soon as possible, the tendency is to initiate many projects concurrently—all with a high priority. This is compounded by the fact that a key measure for Six Sigma certification is the number of projects undertaken. However, one of the most important lessons that lean thinking teaches us is that pushing excess work into a process slows the process and dramatically increases lead times.

Anyone who has ever led a business improvement project or been involved in one knows how hard it is to finish on time. Too many projects running at the same time leads to excessive multitasking, which results in most projects taking significantly longer than necessary. Additionally, dependencies between projects increase because staff members are working on multiple projects. As a result, project completion times are affected not only by the variability of a project's own tasks but also by the variability of tasks associated with other projects. For example, if a key individual is assigned to multiple projects at the same time and gets sick, all of his or her associated projects will be negatively affected.

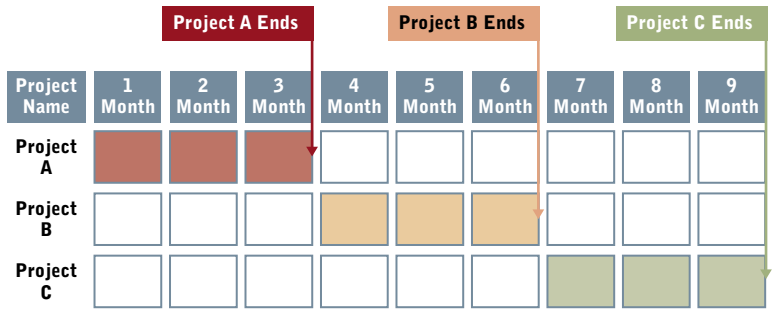
To illustrate: If an organization undertakes three improvement projects—all at the same time with equal priority—the result of the excess work-in-progress (projects) on resource usage and project completion looks like the grid shown in Exhibit 2. It's very important to note that this example assumes zero efficiency loss due to changing tasks, so it actually minimizes the real-world negative effects of multitasking.

Now suppose that the organization prioritizes the improvement projects, devoting the resources full time to each project in turn through to completion. Let's further assume that the project priority, from highest to lowest is A, B, and then C. Instead of all of the projects ending at approximately the same time, the most important ones complete sooner so the savings can surface earlier. The last project still finishes at the same time as before. Note again that this example excludes the negative impact of multitasking on efficiency. (See Exhibit 3.)

The results are clear: If you initiate projects based on priorities and eliminate multitasking, performance improves drastically. It is imperative that the PMO controls the number of active projects at any given time. Focusing projects only on the organization's key constraints rather than flooding the organization with projects ensures that a few high-potential projects are done right. In addition, when the right resources are devoted to a limited number of projects, learning and results are maximized by shorter cycle times.

EXHIBIT 3

The Benefits of Running One Project at a Time



Step 4: *Make data quality an imperative.*

Six Sigma is a fact-based approach to problem solving. Under Six Sigma, it is impossible to make accurate, data-driven decisions without good clean data. In many cases, Six Sigma projects take much longer because teams discover they lack data integrity. Data quality is a huge problem: One study put the annual cost to the U.S. economy of dirty data at more than $600 billion.[13] An organization that lacks confidence in the integrity of its data will not buy into con-

clusions based on the data.

If an organization cannot vouch for the integrity of its data, it is imperative to first run a companywide data-quality initiative. The best way to kick-start such an initiative is to incorporate it into a corporate data stewardship or data administration program. These efforts are typically chartered to establish and maintain consistent data definitions and business rules so the firm can achieve a "single version of the truth" and save time on developing new applications and looking for data.

Step 5: *Don't waste time and resources gathering unnecessary data, performing unnecessary analysis, and creating unnecessary metrics.*

"Analysis paralysis" is one of the most prevalent problems afflicting projects—especially Six Sigma projects as they inherently involve a high degree of data analysis. Often, "black belt" practitioners tend to focus too much on analytical aspects of the methodology, such as data and tools, and devote less attention to higher-level project management aspects like avoiding "scope creep." As a result, many Six Sigma projects, while technically sound, take longer than expected. Time is wasted gathering data and creating measures that aren't directly linked to the original problem.

For example, one company was undertaking a spend-analysis procurement initiative using the DMAIC approach. Not long after the project's kickoff, it became apparent that the spend-data quality was poor because there was little or no policy compliance. Knowing this, the team still went ahead with building the spend-analysis application along with conducting analysis to validate the reports. The validation told them what they already knew: The data quality was poor because of noncompliance. The team would have saved a lot of time if it had solved the data-quality issue when it was first known.

To avoid this situation, projects should not be measured by Six Sigma activity—that is, by how much analysis has been performed and what metrics have been created. Time should not be wasted collecting and developing data and metrics that are not directly linked to the project objectives. The question that should always be asked is: "What do we need to know to solve this problem?" If a data element or metric does not help answer this question, don't spend time on it.

Step 6: *Pursue perfection, but tolerate failure.*

Not every idea and subsequent associated project will be successful. This is simply a fact of life. Implementing improvement approaches such as lean and Six Sigma means launching new ideas and techniques, and that always involves some risk. For any improvement effort to be suc-

cessful, people must be encouraged to take risks without being afraid of the consequences of mistakes. The important thing is to have a formal project management structure that recognizes mistakes so that they won't be repeated—in effect creating a culture of continuous improvement. It is fundamentally important to perform a "lessons learned" exercise at the end of every project, as prescribed during the Six Sigma "control" phase. Many organizations talk about doing this, but few actually do it. Even when the exercise is completed, these lessons are often filed away where they are of no use to anyone. As the saying goes, those who do not learn from history are doomed to repeat it. This is absolutely true for LSS projects.

In a lean/Six Sigma organization, a "lessons learned" step should be a formal part of the project plan. As per Six Sigma's mantra, project teams should always be looking for ways to make project tasks standardized and repeatable. And taking a lean approach means always looking for ways to eliminate waste within tasks. These lessons should be sent to the program management office, which can then consolidate and disseminate this feedback to the black belts and other practitioners through a variety of channels, including formal training. Subsequently, future projects will include researching lessons learned from projects of a similar nature, ensuring that the mistakes of the past are not repeated.

Strategy and Execution

By applying lean program management principles to the strategy and execution of their LSS improvement programs, successful companies have been able to complete projects in far less time and consequently have generated much more value.

These principles—lean, Six Sigma, and constraints management—apply directly to project selection. And project selection is a key driver of improvement project success. A key principle of Six Sigma as it applies to project selection is ensuring that the projects selected have the potential to increase real, tangible shareholder value. Taking a lean approach to project selection means not wasting time and resources on projects that do not add significant value. Project selection should also be guided by the constraints management approach. This involves going from a cost-oriented approach that requires attention everywhere to a throughput-oriented approach in which everyone must work together and focus on key leverage points.

It is not enough to have the right strategy in place. Being able to execute successfully is a key differentiator between companies that are successful in their lean/Six Sigma programs versus those whose programs become bogged down by projects that take too long. When it comes to project execution, lean principles involve managing projects so that the most benefit is attained with the least amount of resources and the number of concurrent projects is minimized. The critical chain project management application results in projects being completed in far less time than under traditional project management methods. Further, applying Six Sigma to reduce variation in project tasks results in project completion times being more reliable and predictable.

The tools and techniques are available to achieve these results. It's time for supply chain professionals who are involved with lean/Six Sigma improvement efforts to apply some of those principles to the projects themselves. Doing so will ensure that they drive the most value for their businesses in the shortest time using the least amount of their precious resources.

Endnotes:

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