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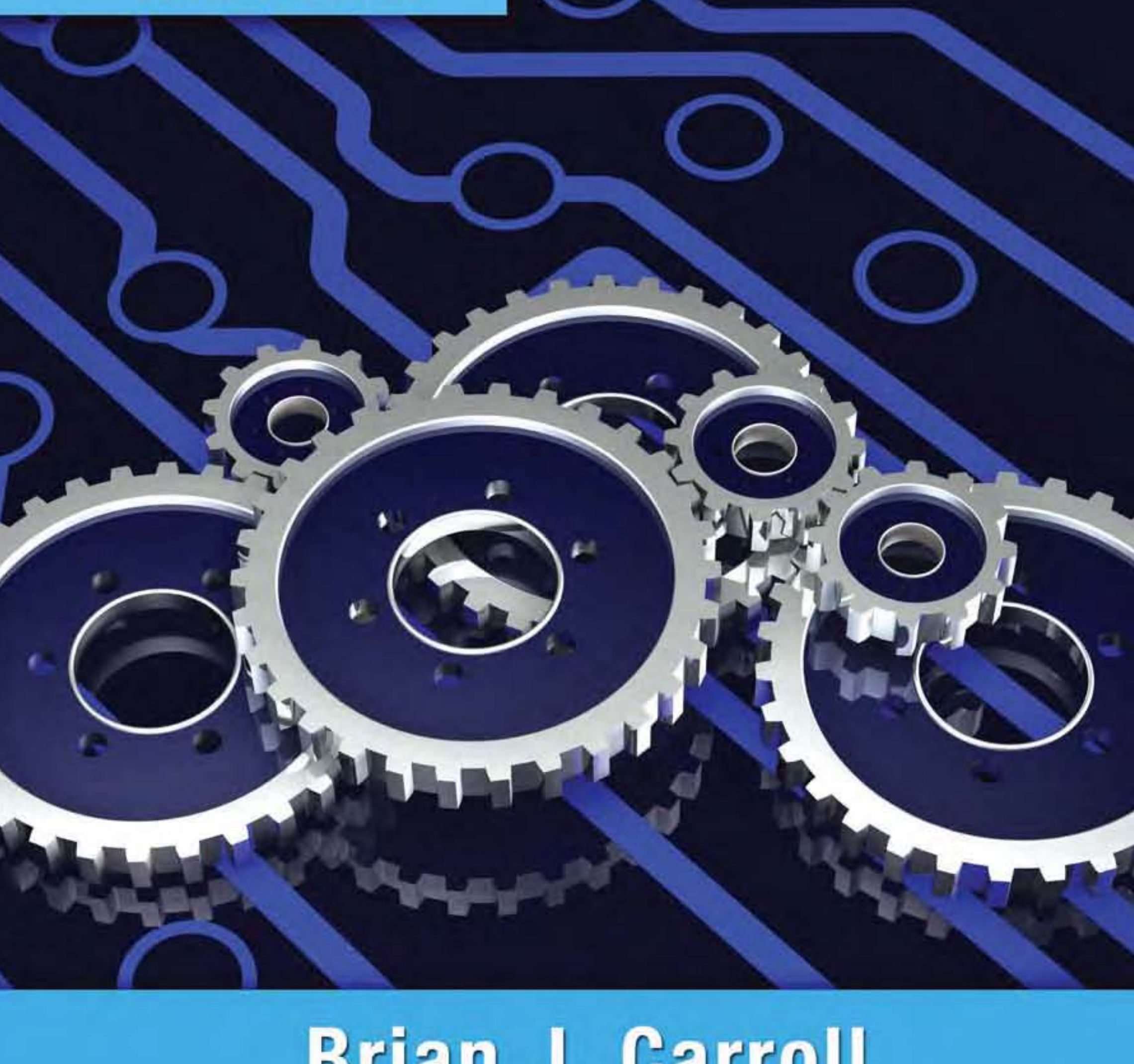
Implementing the Virtual Lean Enterprise

Second Edition



Brian J. Carroll

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"Toto, I've got a feeling we're not in Kansas anymore."

The Wizard of Oz, 1939

In the first stages of any lean engagement, Brian Carroll will always repeat that statement. So, in response, I say to you, Dorothy, or whatever your name is, something is different about the state of business today. But that's not the problem for me: the problem is I can't find a way to get back to Kansas. I fear that after living in that state of business since 1950, a comfortable one I know well, I cannot return there except in my imagination.

This book is different from all other previous business books. This is what makes it unique: it is the first book written that does not encourage me to wish I was back in Kansas. It does not provide me with a map, drawn by someone who has never left Kansas, to lure me back to a state that I, and you, should recognize doesn't exist anymore.

This is the first book that provides a map to get to the new state, call it "lean." Or, better, call it "the Virtual Lean Enterprise." Brian Carroll is the first person to create the alchemy that Masaaki Imai spoke of when he wrote (in the preface to *Gemba Kaizen*), "When Western Management combines kaizen with its innovative ingenuity, it will greatly improve its competitive strength." Carroll has done just that. When I say he has done just that, I mean he first accomplished transforming technological processes into a lean environment, and then, not content with that, he became evangelically passionate about what happened and was driven to write about how he linked lean and ERP. This book, *Lean Performance ERP Project*

Management, was and always will be the first in the world to create the synthesis of lean and ERP.

Carroll's approach is heretical to begin with in the academic world of business management, because the basis of the book—reality—is seldom seen in the kudzu-like growth of how-to management books and, lately, in a similar growth in sudden lean expertise in print (lean expertise that sounds like the right path but often leads back to Kansas).

Why has Carroll accomplished this unique task? Why did he even take it on, looking for the management touchstone that Imai prophesied? The answer is part nature and part nurture, as it is for all of us. To understand, I need to tell you a bit about Carroll's pedigree and about his formative business experience. Some of it seems like fiction. But again, and for the last time, this is likely the first book that I or you have read from the management jungle that was not written by people who never went there and back. There is irony in everything, even business management.

The Management Battlefield We Know

In your training and long experience as a veteran manager, what has given you the best return on your time, money, but mostly your emotional investment? Or maybe I should ask, what has disappointed you the most? I think I know. Your confidence has been abused and you will not be fooled again. Was it technology then that first broke your heart? Was it other people, you know, that dry well that has been called "empowerment"? Does your black belt in Six Sigma still leave you feeling vulnerable? You know how that goes. It's OK. Or not.

What lessons have you learned as you endlessly strove to keep up with everything new to know in management? In my experience, working with strategy development in the rarified air of top management, there is always a new book, a new catchphrase, a new focus, each proclaiming that if we just do this one thing from now on and use it for all possible situations, decisions, and interactions…well, you know the pitch.

Much of our thinking as managers has been formulated by the tools and concepts, "best-sellers," and business training that emerged in the last half of the 20th century. It has become its own industry. Combined, the "pop management" and "pop psychology" cultures of the 1970s have formed who we are as managers and also much of who we are when we are not performing that role.

The cause may be we had too many choices as managers, and too many failures. Everyone—psychologists, sociologists, consultants, and especially CEOs, now the new rock stars—jumped in to proclaim a new management style and began turning out the how-to-lead-the-troops books like it was in their job description or part of their parachute package, even as they outsourced their manufacturing jobs for short-term gain and Wall Street.

Or maybe it was good old hubris, a shortsighted, stubborn conviction that management, like anything else, is best made in America. This was begun with the assumption that our long-standing military model would work in business as well as it worked in war.

Is it merely circumstantial evidence that current United States managers (us), the postwar baby boomers, were also the elementary school students who avoided the adoption of the metric system? This bold, symbolic, nationalistic resistance that has over the intervening decades resulted in our being the only country in the world with a unique and less exact measurement system! Does it really matter if it is less exact? After all, isn't 99.99 percent accuracy still good? Good enough?

We have a phenomenon in America in which we are comfortable with approximating the truth, a corruption that results in a near miss of reality, but allows us one that better satisfies our needs. In a culture of "close enough is good enough," who needs metric? Quality was an American invention, but it did not find a home on this soil, and it still fights to take root. It flourishes in a lean environment in much of the rest of the world.

As I write, Ford has announced a layoff of one out of four of its North American employees. General Motors has responded to the crisis by slowly going out of business, losing market share, closing plants, and spinning off its parts business. Said parts business is in bankruptcy today, and bankruptcy is speculated for GM as I write. An American automotive diaspora seems possible. It's OK?? Or not.

In the news recently was another example of how "mass production" cultural principles and the thinking behind them work against development of the lean cultural principles that underlie a truly lean enterprise. In the continuing sagas of GM and Ford, it is occasionally proposed that the "legacy" costs for pension and insurance benefits that load approximately $1,000 in costs to each car produced be somehow removed from the cost equation. The most insidious of the proposals include the notions that the U.S. taxpayer should assume them—or even that these retired workers should be "cut loose," much like the Inuit Indians (Eskimos) practiced euthanasia by placing their elders on ice floes and pushing them away from shore. Is this OK?

In correspondence with James Womack, who alerted the U.S. Congress to fallacies of protectionism, and his colleague Daniel Jones, Carroll proposed that GM should follow Toyota's lead and create momentum toward a lean culture first, beginning with a "global refinancing" that sheds the unfunded legacy burdens by selling legacy investments such as the Asian operations of GM that were built with the profits of the mass production era, profits that might have been invested in funding those very same legacy costs that haunt GM today. With a clean cost slate, and perhaps a reinvigorated workforce, a new "social contract" between management and labor could be written. It would be much like the historical precedent found in the new social contract Toyota enacted in 1949, when its founder resigned over the mass layoffs he instituted, and lifetime employment relative to market was promised to a workforce that agreed never to strike. What might happen should GM take this approach? Ominously, what will happen if GM doesn't?

The Deming Code

"Pay no attention to that man behind the curtain!"

The Wizard of Oz, 1939

The strategic management approach followed by the "military generation" of American business management in fact heralded the coming global economic conflict that W. Edwards Deming had prophesied following World War II. Deming was viewed by our victorious American military-trained managers then as just another "chicken little," a "sky is falling" prognosticator that no one paid any attention to under the eternally blue, halcyon skies our victories had delivered over fascism.

Deming's story is the stuff of management legend, now and always. We have already placed the blame for our recent manufacturing failures on a hopelessly conservative group of industrial managers from the stodgy 1950s who institutionalized the Taylor–Ford fallacies. We proclaim that the '50s managers mired all of us in ancient mass production practices, unaware of the "lean" storm approaching from one of the countries they had just decimated.

But the fact is, we managers—who are the sons and daughters of those '50s managers—are more likely to be the major reason for our late arrival into the global marketplace: the reluctance to change in the face of a new global economic model that arrived on our shift—and now we are no longer the stars on the team. In fact, we may not make the starting squad, because all the plays have changed. It is no longer "OK."

For the sake of discussion, let's focus on the near apocryphal figure of the aforementioned Mr. W. Edwards Deming. Deming is the figurative as well as the literal bridge between Eastern and Western management thought. To look at some of the areas where Western managers may have difficulty as we endeavor to incorporate lean thinking into our toolbox, let's take a survey of current Western management thinking through the lens of some of Deming's famous 14 points. (I am sure as a veteran manager you have them memorized so I could probably just refer to them by number, but they are listed below for the purpose of our discussion.)

1. Create constancy of purpose toward improvement of product and service, with the aim…to provide jobs. In the face of the wholesale flight of manufacturing, what is the focus of American leadership or management: are they stewards of jobs, or of profits, or is that a divide that was created years ago?
2. Adopt the new philosophy…Western management must awaken to the challenge...and take on leadership for change…blah, blah, blah. Leadership? Change? And philosophy? What—has Deming gone native?

3. Cease dependence on inspection to achieve quality…do we even get this now, 50 years later? Aren't we still an inspection-based, nonvalue-added, MUDA-producing mass industrial culture?
4. End the practice of awarding business on the basis of price tag…minimize total cost…single supplier…long-term relationship…loyalty and trust. Where do we start here? The different thinking and philosophy of long-term relationships built on trust and loyalty, the move to minimize cost, a strategy espoused by both Western management gurus (the Drucker low-cost provider strategy taken to a higher level by Wal-Mart) and Eastern lean thinking. Again, how well have we adopted this commandment, or, I mean, recommendation?
5. Improve constantly and forever the system of production and service…first, this is the basis of all management thinking that has quietly invaded us since the late (1970s) 1960s, again, with very little movement on our part, and second, Deming was speaking about the whole company, not just the factory floor processes. This is an approach to lean that has been reawakened by Brian Carroll, who, from experience, not from theory, knows that if everyone isn't involved in the lean transformation, then nothing changes, no transformation, just the veneer of lean…like a politician, wrapped in the flag and protesting his innocence. Maybe, like Delphi.
6. Institute training on the job. Well, we kind of did this, but pretty much in accord with our command and control approach, from the neck down, and in the process capturing workers in cementlike job descriptions that have kept them from ever enacting #5 or #3. Oh well, continuous improvement, quality, these were small losses to keep our management structure intact in the face of all that external pressure to change (which also means we didn't follow #1, 2, 4, and 6 as managers).

Points 7, 8, and 12 all kind of come together here, and I will paraphrase abundantly and without shame. Deming says to institute leadership; we have had enough of supervision of both management and production workers, and in order to be effective, we have to do what leaders do first, and managers never do because they use it as a means of control: drive out fear. And finally, Deming says as leaders we need "to remove the barriers…that rob people of their pride of workmanship."

And throughout the rest of his points, Deming appeals to us to "substitute leadership" by removing quotas, and management by objectives, adding education, and making it everyone's job to transform.

The Deming Legacy and Brian J. Carroll

Increasingly, we in the globalization era are forced to confront and analyze management processes in this new, non-Kansas lean globe. The model that Deming foretold is on us. We are compelled to compare East vs. West management thinking, really

Eastern All of Us Thinking (Lean) vs. Western Us and Them Thinking (Mass). The leadership processes, principles, and practices of both have been endlessly written about and analyzed.

So, why bother with "lean ERP"? Why should anyone think Carroll isn't just another Western prognosticator, all vision and no application? Well, from my perspective, Carroll brings a decidedly "non-Western" vision to the problems of management, and a full system for applying it. He begins where Deming ended, and no other management thinker in the Western pantheon has begun: with principles, the cultural principles he observed in successful work environments, as well as the lean transformational principles from predecessors like Womack and Jones. He echoes and builds on Deming and applies the transformational principles of Womack and Jones, but like Dylan going electric, he adds technology to the mix.

Carroll exhorts us to follow the process to the customer, to enable it with the technology available (ERP), to train and educate and to lead the lean transformation, not simply to manage and supervise the workers. All that he writes about, all that he lays out methodically, step by step, to get there, like Deming, comes from what he has seen work, and like Dylan transforming folk into rock, what he loves forms the basis for his groundbreaking, yet achingly familiar, principles.

I do care that we have still come last in the world to adopt, let alone believe, those principles and practices, most invented here, utilized to win the global conflict that defined the latter half of the "American century." The same elementary students who resisted the global shift to metric, now gray-haired and in charge, are still resisting change at an elemental level, and at such great cost to the economy and to our children's legacy. But I have to briefly play historian and offer a bit of a timeline, picking out a few of the many important and, in my opinion, formative moments in Carroll's life.

In preparation for this task, as I reviewed many of the people who came to be leaders in management revolutions, it was apparent that all were influenced early on by firsthand encounters with other figures in the management pantheon. Carroll first learned them from his father, who coincidentally didn't just carry the influence of a father but was also involved in many of the important industrial and manufacturing events of the middle part of the 20th century. Carroll Sr. worked his way up from the production floor at Hughes Aircraft, tested planes with Howard Hughes himself, and then worked at the Ford Motor Company with Henry Ford and Charles Sorensen on the project that delivered the production system (a "lean flow," by all measure) utilized to build the aircraft that dominated the skies of World War II. Carroll Sr. then helped build Motorola from a small company in Chicago into a global powerhouse.

Brian Carroll, though he balks at the comparison, is the closest thing we have to a Deming in the 21st century. He certainly wouldn't put himself in that level of influence. He also has a Gump-like propensity to be at the right place at the right time when a paradigm shifts. He has been riding a wave of paradigm shift since the mid '70s, when, after working his way up from machine operator to production manager, he was lucky enough to be assigned to work with a customer who was an early adopter of "J-I-T," having been forced to adopt this early lean practice by a customer, Hewlett-Packard. At a critical stage of career development, his mentor, a Professor of Operations, introduced him to Oliver Wight, widely credited as the "father of MRP." At the meeting, Wight asked Carroll if he intended to pursue the MRP project management assignment that Carroll had been offered. Carroll was hesitant to abandon the safety of the shop floor, where things were actually made, for the uncertainty of the computer, where things didn't always work so well. Wight asked Carroll if he thought he would make it to the end of his career without learning the computer and MRP. Could one safely hide in the shop for the following 35 years until retirement (Carroll was then just 28 years old) and avoid progress? Carroll took Wight's advice and managed to be on the scene for early implementations of packaged MRP and then ERP software, eventually completing 25 successful implementations as a team member, project manager, or project director. Although given the benefit of many years of mentoring by the aforementioned Professor of Operations, Carroll somehow claims that one of his best advantages is that he lacks a formal American business school background. He does not possess an MBA, which he says is the degree in *mass* business administration and will be, according to Carroll, soon to be replaced by the LBA—the degree in *lean* business administration. Instead, he can lay claim to having had the benefit most especially of a "bottom to top" rise through the ranks—from machine operator to executive and then executive consultant, a tour of duty required of anyone desiring to rise to executive rank at Toyota, and a privilege given there to only a handful of incoming junior staff.

Carroll jumped from assignment to assignment, performing nearly 30 different line and staff assignments (in only four companies) before shifting to consulting, where he developed an international practice, and eventually his own methodology that realized Imai's prediction. He states that when he realized that he could not pretend to be an expert in a process that someone else "owned" or "operated" it was time to shift from consulting to teaching and facilitating. Carroll says he is an expert in his process—lean ERP—and that he can teach and facilitate in that arena. You will have to work out your own lean processes, but Carroll and this book can enlighten and facilitate that journey.

The Next Phase—Lean Dominates the American Marketplace

"I'll get you, my pretty, and your little dog, too!"

The Wizard of Oz, 1939

Of course I also hope that Carroll, unlike Deming, is not ignored for another 50 years in America, while the rest of the world adopts him to further the lean gap. Carroll and Deming are unique in being bridges that connect the Eastern and

Western schools of management. Deming, of course, through a forced exodus and an adoption of Eastern principles, developed a methodology that influenced the world—even eventually American managers (although even then only partially, sampling only what called for the least change in attitude and behavior). But to this experience in the later part of his life, Deming brought the foundation of his training (at Western Electric, under Shewart) as a manager in the first half of the 20th century, the mass production era of industrial age, creating his own contribution to quality that was to not only form a bridge for the management thinkers of the second half of the century, but also be the foundational glue for how work gets done around the world. Deming, like Carroll, goes largely unheeded, and though he points to the decline of Western mass manufacturing, which had already peaked by the mid-1950s, no one paid heed. Well, someone did on the other side of the world. You already know how that story turned out. Today, in hindsight looking at Deming, and in comparatively safe second sight, looking ahead to Carroll's coming influence, Deming is the principal "bridge" management thinker of the 20th century, and Carroll is poised to be the same for the 21st. Carroll has fought not only to reconcile but also to marry the information machines to the lean processes throughout the company and across the virtual space that he calls "the Virtual Lean Enterprise." Still, the DNA in the machines, and in the lean tools and practices, is our customer's, and if we reject the tools it is because of this factor. The maddening thing about the customer is that just as you get the dose right and the process right, it needs to be adjusted again and will always need that as software is implanted into old processes. Nothing that is linked to the customer is stagnant. Innovation is driven by strategy, and strategy in Carroll's Lean Performance methodology is deployed to the organizational process level. The best technology of the 21st century then enables lean processes at the activity level, allowing the customer to create the pull and flow of your business.

Like Deming, Carroll also has his own list of principles, and we are reminded painfully that principles are things we believe in and not just able to recite. Again, like Dylan building off of Guthrie, or the Stones off of Howling Wolf, he brings lean to the next level, one that incorporates technology that Deming heralded. Only Deming could have begun to conceive of a worldwide supply chain forged by a technology not yet conceived. Only Carroll could have created the formula for this to happen.

Finally, it may surprise many readers to learn that a code of action for ethical leadership by management was first formulated by Henry Ford, in his initial Dearborn Works Charter in 1914. Carroll refers to this "manufacturing magna carta" in the text that follows. The principles and practices espoused in this remarkable document were soon forgotten at Ford and indeed everywhere but in the defeated Japan, where this thinking elevated the industrial emergence more than a half century ago. But Carroll didn't forget—it appears to be the only approach he knew.

Signs of the Coming of the Lean Era

Since the publication of the first edition of *Lean Performance ERP* in February 2002, events have converged to further support the substance of a book that has fallen short of being a business best-seller yet sits in every university engineering library from Saudi Arabia to Macedonia to China and Japan. If you had been one of the few reading the book five years ago, the events that happened afterward (e.g., the discovery of the manufacturing planet of China, the realization that lean could not coexist in some de facto basis with ERP, the understanding that supply chains would be redefined by new technologies, and the Wal-Martization of America) would have made you a leader with the prescience to get the place lean before everything fell apart.

In the period following the book's publication, and the tremendous lack of adoption of its lean principles in practice, the economy has morphed rapidly into the round earth global picture. In 2002, as the book hit the stands, the "advanced economies" (Western European) GDP grew at about 1.7 percent, while the Asian economies collectively grew at 5.9 percent. In the second year after its publication, 2003 saw the official end of the Iraq war (May 1), SARS was named, the Blaster worm virus attacked most of our computers, and *Forbes* magazine declared "white collar offshore outsourcing" the year's most significant trend. By 2004, three years later, we still hadn't picked up lean; we saw that the United States was holding about 20.9 percent of the world GDP so maybe we didn't need to do something as drastic as getting lean. But wait a minute, in 2004, the United States grew GDP by 4.3 percent, but China grew at 9 percent. Wait another minute, where did I put that book on lean?

Here we are in 2007 with the publication of the second edition, and India is the rising star of global business, and the analysts, those prognosticators of world economic doom, are wondering if it is just possible that GM may follow Delphi into bankruptcy. Wait a minute, wasn't Delphi lean? Is it no longer OK to stay in Kansas? Well, I am glad you asked that question.

The Lean Path to Follow

> "Follow the yellow brick road; follow the yellow brick road."
>
> *The Wizard of Oz*, 1939

It is never too late to correct a mistake. This is the greatest pearl of wisdom I have learned and lived by in 20 years of strategic management, and in nearly a quarter century of marriage (but that is another book). Since my early years as a recalcitrant, ethnocentric elementary school student rejecting the adoption of the metric system, I have learned it in order to do business throughout the world. I would expect no less of you that you read on and follow the directions. Five years from now, where will you be then?

Don't worry about roads not taken, about wrong turns, don't fret that you have come this far for something that isn't there. Just keep reading, follow the directions, and you will get there much sooner than you realize. All you need is the ability to believe in some principles that won't make you successful until everyone else is in the process.

It is significant that two of the architects of significant change in the business models, and management practices necessary to build them, Deming and Carroll, are both detail-oriented, scientific thinkers. One is the midwife of statistical process control, and the other is the first to successfully incorporate Western technology, ERP, into a lean process enabler for the production of goods and services. Yet both begin a methodology with principles that speak to the least scientific of our understandings as human beings, that is, of other human beings. Both mandate with the maddening sureness of a scientist that you must change the culture from competitive, command and fear-driven control to one that is, well, you know where this is going.

Other issues still lie in wait for you, the nascent lean champion, before you begin the digging:

1. Make this transformation a project, not a process: define it and get it done. There is very little twilight land in which to linger safely between being in a place of mass production and thinking, and being in a place of Lean Production and thinking. There is very little room to equivocate between the two.
2. Don't linger. People will pull back, slip away at night, build coalitions, and talk behind your back. You know how that goes.
3. Finally, how will you incorporate your technology into your lean processes? If book sales are an indication, a lot of people have been listening to Carroll, but very few so far are in the United States.

Think of this as a second chance to learn the metric system. It's OK.

Conclusion

> "There's no place like home."
>
> *The Wizard of Oz*, 1939

So there are a couple of things to agree on at this point. First, unlike the Hula Hoop, certain dolls and action figures, and the Pet Rock, computers are not a fad. Second, an enterprise must exist in a round world, a global economy, and a borderless, metric marketplace where lean is the clear winner on quality, cost, and delivery. Et tu, GM? Remember the hard-won lessons of the elementary tykes (Dorothy and the gang) who resisted metric and now must buy two sets of wrenches and constantly quibble about tolerances with their outsourced suppliers, a clear supply-chain case of "you say potato" and I say, well, you know how that goes every day.

The chain from suppliers to customers will break continuously, let alone be lean, without the enabling power of technology. This is the ultimate tool to put in the hands of the process owners and operators, in every process in the factory and in the boardroom. Again, this is assuming, as Carroll did prematurely, five years ago, and as Deming before him, that everyone is thinking lean and ready to change.

The failure of Western management thinking was not total, but it was decisive as the century turned in positioning us to be playing a defensive position in a growing global marketplace. Leadership is necessary in the lean movement; you can't manage your way to the state of lean. The fact is, war is won in the foxholes and trenches by the men and women who are willing to fight and die for their fellows, and for what they understand and believe. Squad by squad they have always won the wars—something the strategists cannot ignore. "Drive out fear," indeed. "Loyalty to people enables continuous improvement."

Our teams of workers work for themselves *and* each other. We would be wise to know and remember that before we "outsource," "right-size," "downsize," or otherwise employ misconceived "strategies" that destroy the fabric of the team. The only remnant of military management, the sole principle I would encourage you to hang onto as you lead the exodus to lean, is that the first rule of leadership is to take care of your people.

I would exhort you to take a shortcut. It's OK. No sin. Very secular. Leadership is born of the kind of suffering we share, the experience through which we have suffered. Managers are doomed to a life of leading recidivistic people: it's human nature not to want to change. But rather than our old natural instinct or behavior, our new leadership challenge is to teach others to do it themselves by getting lean, like getting religion.

Finally, maybe it was just the time. Maybe we just declare victory with how we did it up until recently and move on. Don't look back. It is not possible to return to the old, flat-earth, "Kansas" management thinking; we will never return to the good old days. And how long ago were they anyway? And good for whom?

The move to lean thinking then is an act of faith. Perhaps this has been the missing characteristic for all of us as managers. We got very professional with our business schools, best-sellers, and seminars. We got very experienced in a cynical way, irony alloyed our enthusiasm, and finally, we became sanguine in our style after always getting defeated in our approaches after the failure of every newly inspirational seminar or book.

But did we ever really possess the faith in those working alongside us that was necessary for success? Success stories are rare and usually culminate with someone selling the company, jobs going overseas, some contraindicator that all is now well forever.

Once we manufactured everything made in the world: every item and every innovation. Have we failed the U.S. worker? That's not OK.

Perhaps it is enough to admit we did and move on. The therapist yells "breakthrough!" We are cured, whole, no more us and them, officers and men, management and labor. I'm OK, and you're OK, and isn't that good enough? Fade to lean.

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Preface to the Second Edition

The first edition of *Lean Performance ERP Project Management* was written by a veteran of ERP implementations in manufacturing environments that were working to "get lean." We hadn't always called it "lean," however. We had called it J-I-T, Zero Inventory, Synchronous Manufacturing and Continuous Flow, and several other names. MRP was often viewed as the enemy in these embryonic lean enterprises. Empowered by a lean management team and the beginnings of lean cultures in several of these implementations, I managed or directed projects that were successful in employing Lean Performance ERP in what were becoming very lean enterprises. I emerged from these experiences and wrote the first edition of this book. I thought that everyone in manufacturing would embrace Lean Performance ERP and that those same manufacturers as well as service industries would readily embrace "lean in the office." I was wrong. American manufacturers who had been struggling with MRP transitioned into struggling with lean, and later with lean and ERP/MRP. The ERP/MRP proponents often reject lean as "simplistic—yesterday's news" while lean advocates posit that ERP/MRP is the dinosaur. In this second edition of *Lean Performance ERP Project Management*, I am adding the "why do it" of Lean Performance ERP/MRP implementation to the first edition's "go do it" perspective. I hope to convince the skeptics, on both sides of the issue, that lean and ERP/MRP are not only compatible but that they need each other. I would ask the reader to suspend his or her disbelief about the relative merits of lean and ERP/MRP and consider the case that this book puts forth.

It is apparent that many lean implementations fail for the same two primary reasons many ERP/MRP implementations fail—lack of education on how to accomplish the desired outcome and lack of directed commitment to change. As the global lean phenomenon accelerates, failure at lean is a doomsday scenario for American manufacturers. ERP/MRP systems form the backbone of global commerce, so failure at ERP/MRP implementation is likewise a doomsday scenario.

I hope this second edition helps to educate on the desired outcome: lean and ERP. It is up to the individual to accomplish the commitment to change.

I would like to explore for just a moment three additional themes that I believe make the publication of a second edition of this book desirable. The first theme is the title of the book itself. The title (actually subtitle) of this book has been returned to that which was originally submitted for publication in 2001. Readers of the first edition will notice that the original subtitle that has been reinstated is *Implementing the Virtual Lean Enterprise*. There are three key reasons for this change:

1. The subtitle for the book as originally submitted was *Implementing the Virtual Lean Enterprise*. The powers that be in the publisher's office decided that no one would buy a book with that subtitle. It was felt that that subtitle would not be understood by potential buyers. It was felt that "supply chain" was a term that had more currency at that time.
2. There are many good books on the market that are more suited to bear the subtitle *Implementing the Virtual Supply Chain*. The book you are reading presents only a portion of supply-chain implementation, that being the technical ERP/MRP foundation. There is plenty more to do to implement a supply chain, virtual or otherwise, and many books on the market do just that.
3. This book refers to the Virtual Lean Enterprise repeatedly, and is in fact about the Virtual Lean Enterprise. The Virtual Lean Enterprise is a real thing—it is the virtual connection and coexistence of linked producers in any lean enterprise: the automotive lean enterprise(s), the PC lean enterprise(s), etc. The Virtual Lean Enterprise is especially vibrant in the shared intersection of virtual space where the producers of products and services common to multiple lean enterprises collect, process, and share data about supply and demand.

The second theme that makes this second edition desirable has to do with the necessity of lean transformation and implementation of the Virtual Lean Enterprise that is imperative upon the West as the Eastern manufacturing base increasingly dominates global business through the emergence of lean global supply chains increasingly interconnected through channel Virtual Lean Enterprise technologies.

The third theme is the fact of the new challenges facing the ERP implementer, especially in a lean environment—or an environment attempting lean transformation. The typical project manager wants to be equipped with a current discussion of the latest events and theories on the topic and then see the "toolkit" with which to address them. It is my hope I have provided project managers with a relevant discussion on the latest theories and topics in the ERP/MRP project area. Here is a listing of the new evaluation and implementation tools included in the second edition that can provide implementation assistance:

New figures:

- Figure 3.1: Lean Business Processes: Strategic Level
- Figure 3.2: Lean Business Processes: Organizational Level
- Figure 3.3: Business Process Example: Organizational Level
- Figure 3.4: Engineering Change Notice: Process MUDA
- Figure 3.5: Supplier Selection Qualification 5 Ws-1H Checklist Result
- Figure 3.6: Supplier Selection 4 Ms Checklist Result
- Figure 3.7: Engineering Change Notice: Current Process
- Figure 3.8: Engineering Change Notice: Future Process State
- Figure 3.9: Engineering Change Notice: Lean Benefits
- Figure 4.2: Lean Commerce Model—Customer Relationship Level
- Figure 4.3: Available to Promise Inquiry
- Figure 4.4: Lean Commerce Model—Sales and Operations Planner Level
- Figure 4.5: SOP Planner Screen
- Figure 4.6: Lean Commerce Model—Lean ERP Level
- Figure 4.7: Assembly Scheduling Screen
- Figure 4.8: Lean Commerce Model—Factory Flow Level
- Figure 4.9: Final Assembly Screen
- Figure 8.1: Key Lean Software Features—General Requirements
- Figure 8.2: Key Lean Software Features—Business Planning
- Figure 8.3: Key Lean Software Features—Production and Operations
- Figure 8.4: Key Lean Software Features—Customer Relationship
- Figure 8.5: Key Lean Software Features—Product Engineering
- Figure 8.6: Key Lean Software Features—Financial Management
- Figure 8.7: Key Lean Software Features—Inventory Management and Logistics
- Figure 8.8: Key Lean Software Features—Supply Chain
- Figure 8.9: Key Lean Software Features—Performance Measurement
- Figure 11.4: Lean Performance Loyalty Analysis Template
- Figure 11.5: Lean Performance Loyalty Analysis—Policy Deployed
- Figure 11.6: Lean Performance Loyalty Analysis—Strategy Deployed
- Figure 11.7: Lean Performance Loyalty Analysis—Objective Deployed
- Figure 11.8: Lean Performance Loyalty Analysis—Technology Deployed

New checklists:

Preface to the First Edition

What Is Lean Performance?

Lean Performance is a project management methodology for lean implementation that starts with existing processes and develops process performance improvements and measurements. By developing process workflow standards of *what* work must be completed, and then utilizing the process workflow standards to determine *how* to do the work, Lean Performance produces process work instructions for training to ensure continued process quality. Lean Performance also manages multisite projects by identifying common processes and prioritizing assignments. The methodology develops process performance measurements and Continuous Lean Performance where information technology has already been implemented, or as the implementation methodology for new projects.

Lean Production is the philosophy and practice of eliminating all waste in all production processes continuously. Manufacturing workers may apply lean principles, tools, and practices successfully to continuously improve production processes, but usually information technologies do not readily enable continuous improvements in management decision processes, information/support processes, and linkages to physical processes. Methodologies for information technology installation such as reengineering and process or system innovation do not facilitate the use of Lean Thinking to readily enable continuous improvements in management decision processes, information/support processes, and linkages to lean physical processes. Until now, lean thinking has narrowly focused on physical processes. This limited approach has several serious shortcomings:

- Process improvements driven by information technology are not always linked to management strategies and objectives.

- Management decision processes do not support lean physical processes.
- Physical process lean improvements are not supported by or linked to information systems.

The Lean Performance methodology presented in this book suggests a solution. Lean Performance uses lean principles, tools, and practices to improve and then *continuously improve* management decision processes, information/support processes, and their linkages to lean physical processes. The methodology trains and empowers the in-house experts, the process owners, operators, and customers, while employing the best of the process and system innovation and reengineering tools (from a lean perspective) to achieve system integration. Lean Performance develops or enhances a company culture of continuous improvement by recognizing the strength of the business (i.e., people and processes). Lean Performance integrates strategy, people, process, and information technology into a project management methodology that applies lean thinking to all processes by utilizing eight implementation and training modules.

Why Is Lean Performance Important?

Today's manager is faced with the dilemma of managing emerging cross-functional and cross-enterprise business processes such as e-commerce and the new supply-chain management processes utilizing information technology in a business enterprise with an increasingly empowered team culture. All too often, traditional information system development based in methodologies such as reengineering and system or process innovation is woefully inadequate for use in an empowered team culture. Even in more traditional business environments, process analysis and system development projects run and performed by business or information technical "experts" often deliver miserable results, especially from a quality standpoint. Delivered systems either do not work technically or do not fit the process as the user performs it today or could best perform it tomorrow. In contrast, great results have been obtained by harnessing the power of all enterprise team members through methodologies that employ lean philosophy and thinking, such as Total Quality Management (TQM), *kaizen*, and continuous improvement. The Lean Performance project management methodology presented here incorporates lean philosophy and thinking in a task structure that, when executed, implements lean management decision processes, information/support processes and information linkages that support lean physical processes and provides the structure to improve physical processes. The methodology performs best in the empowered team business environment, utilizing vendor-supplied, unmodified software packages for manufacturing such as enterprise resource planning (ERP), supply-chain management (SCM), operations planning systems (OPS), advanced planning systems (APS), manufacturing execution systems (MES), and customer relationship management (CRM).

A successful business process improvement or redesign approach to implementation of these systems must consider input from the two hemispheres of management that are in conflict in a typical project:

1. Departmental, politically based management practices.
2. Emerging information-based management practices.

In many companies, established politically based management practices rely on an individual power-oriented management style that leverages power gained through controlling a “stovepipe” departmental structure and the flow of information (work) residing within that stovepipe. These structures depend on internal management alliances to manage the business through a process of negotiation, compromise, and accommodation. Emerging information-based management practices are fundamentally different in that the information that is held hostage in the stovepipes of the old style organization is open in the empowered team workplace. In fact, opening up this information flow and designing work around it (workflow) is the real (and perhaps only) reason to consider information technology–enabled process improvement or redesign. With open information, old alliances are not necessary, and team-based decision making can take place. Departmental structures are no longer efficient and are replaced by product and process stream structures.

Obviously, these structural changes can be very threatening to old-line (stovepipe) managers, and they resist them. When the information technology specialist (MIS manager/CIO/system analyst) is introduced into the mix, numerous complications occur. The lack of a common language between power-style managers (who translate their information requirements into newer and better stovepipes) and technically adept information technology/data processing experts (who do not have the business process expertise of the people already performing the existing processes) leads to enough confusion to sink many business process improvement efforts. When the process owners/operators are not the process designers, nonvalue-added tasks will dominate a new stovepipe at the end of the project. This collision of dysfunctional styles is a fundamental impediment to success in the information age, much as office-based manufacturing engineers of the mass industrial age were an impediment to success in the factory, leading to their removal by the originators and practitioners of Lean Production. Lean Performance defeats the nonvalue-added process constraints imposed on processes by well-intended, technologically adept but misguided individuals who presume they are “experts” in processes that they themselves do not perform.

Applying the Lean Performance methodology to a business process improvement or redesign project focuses the efforts on a common approach that uses common principles, tools, and practices. This approach promotes successful dialogue among the managers, information technology specialists, and emerging computer-literate knowledge workers and team members, who in many cases are already in the workplace but generally not (yet) in a position of management. Lean Performance leverages the expertise of existing internal process owners, operators, and customers to design processes in terms of what needs to be done to produce value (product or service) for process customers immediately downstream. All methodology tasks are structured to “pull” process redesign/improvement activities from the point of view of the external customer so that optimum customer value is provided.

How Does Lean Performance Work?

Lean Performance identifies and deploys lean management business policies and strategies during software implementation, process improvement, and lean transformation projects by integrating lean thinking and process-oriented management at the management decision, information/support, and physical process levels through the use of an integrative project and management practice: the Lean Performance Analysis. The methodology then utilizes Business Process Reengineering practices to design the process architecture. Lean Performance employs lean practices to develop Lean Performance teams of process owners and customers. These Lean Performance teams eliminate waste from existing management and information/support processes while developing value-added information linkages to support lean physical processes and improve physical processes. Additionally, Lean Performance employs system innovation practices from a lean perspective to provide a project management work plan and toolkit to integrate the information system (ERP, MES, ASP, SCM, OPS, CRM), and to provide an ongoing continuous improvement tool after implementation.

Who Is Lean Performance For?

This book is geared toward the 21st-century business manager, a new manager who is developing in the lean workplace: one who manages *with* technology, not one who simply manages technology. I propose that there is a critical difference. These new managers will have used information technology for most of their careers and will readily agree that most information technology projects fail or deliver poor results and require extensive after-project rework. These managers may already be chief executives or chief operating officers, engineering or operations or materials managers, or continuous improvement or lean coordinators. They have probably served as project managers at some point or now employ project management approaches to team management. Project managers who have been exposed to Lean Production are a ready audience for this book. These managers are or have been successful employing lean methodologies in their current or previous assignments.

Information technology (IT) professionals, on the other hand, may not see the relevance of the methodology. Many IT professionals may be all too familiar with the failures of previous projects and methodologies; however, seasoned IT professionals who are ready to try this more comprehensive approach will immediately hone in on the most obvious reason for IT management to support Lean Performance: Lean Performance puts the responsibility for a successful implementation or transformation squarely on the shoulders of the process owners, operators, and customers. The typically noninvolved system user of the past cannot function successfully in a Lean Performance environment.

Why Did I Write This Book?

I wrote this book in part because it expresses my theoretical interest in business process and performance improvement methodologies, and it incorporates what I have learned about them by trial and error. In my career in manufacturing management and consulting, for a variety of domestic and international companies, I have had the opportunity to try out various approaches to business improvement and project management. Lean Performance is the result of my attempts to develop a methodology evolved from classical business consulting approaches but viewed through a lean thinking lens. Perhaps most important, I have had the experience of being a project manager subject to Murphy's first law of project management: about the time you know enough about what the project is about to write a comprehensive project plan, you don't have time to stop managing the project and write it. For this reason, I wanted to develop a project template for myself and other project managers to interpret and apply to our own projects, so we would have a comprehensive methodology to apply before their weight becomes all we can carry and there isn't time to write the plan.

As fond of information and other technologies as I am, I believe that the more complex and therefore more valuable (and costly) elements of business processes are tasks that are people based. When we de-emphasize technology, and introduce the concept of managing the office and linking the office to the factory with processes, in much the same way as we manage the factory, then introducing lean principles, tools, and practices to the management, information/support, and physical process linkages becomes possible. Although my preference is to emphasize manufacturing, the broader methodological concepts are appropriate to computer-based process management and to all business processes, regardless of service or industry. Also, the transition into the 21st century has revealed performance gaps in many new systems that will benefit greatly from applying Lean Performance.

In conclusion, management and information/support processes and information linkages to physical processes are not ineligible for continuous improvement. The Lean Performance methodology is a process-oriented approach that provides a project management structure for applying lean thinking to the entire enterprise, with an emphasis on the management decision, information/support, and physical processes.

Application of lean thinking in the factory has resulted in the elimination of some portion of direct labor while maintaining the same or greater productive output from fewer workers. The application of lean thinking to the office results in a reduction of management layers, with a corresponding higher output flowing from the same or fewer knowledge workers. The real challenge to the enterprise in applying these lean principles, tools, and practices is to recognize that, above all, lean is a growth strategy. Management cannot expect workers to continuously improve their way to the unemployment line. New challenges must continuously be presented to today's Lean Performance teams by modern managers who manage with technology.

Brian J. Carroll
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In addition to the continuing support of many of those mentioned in the acknowledgments to the first edition, I would like to thank those managers and students who have contributed ideas and energy to the Lean Performance certificate classes I teach in conjunction with the University of Illinois at Chicago (UIC) Institute for Entrepreneurial Studies and the Center for Enterprise Development. I would especially like to thank the teams from Amurol Food Products, Emerson/Sealmaster, Medline Industries, Elite Engineering, Northrup-Grumman, Weathermakers, Texas Instruments, American Circuits, Midwest Folded Products, Peerless Mounts, and several teams at Kay Manufacturing as well as at Smith and Richardson. The success of these managers and students in the application of Lean Performance principles, tools, and practices sustains my vision of a lean transformation in the American lean economy.

Acknowledgments for the First Edition

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About the Author

Brian J. Carroll is president of Performance Improvement Consulting, Inc. (PIC), a management consulting and education firm specializing in Lean Performance services located in Downers Grove, Illinois. Mr. Carroll has 35 years of manufacturing management, management consulting, and education experience. His résumé includes positions in operations, logistics, warehousing, customer service, production and inventory control, project management, materials management, and general management, all in the automotive, integrated circuit, and metal fabrication industries. In a career transition to management consulting, he conducted over 50 engagements in manufacturing management and information technology for domestic and international clients. Mr. Carroll performed consulting engagements in industries producing healthcare equipment, flexible automation, packaging machinery, and fluid hydraulic pumps. He has extensive consulting experience with producers of automotive products, including engagements with manufacturers of automotive motors and fans, fuel control systems, electronic control units, fuel pumps, antilock braking systems, radios and CD players, plastic injected molding, alternators, starters, generators, and engine management systems. His completed projects include software evaluation and selection, operations reviews, information systems organization design and implementation, and process improvement. In addition, he was a team member, project manager, or consulting project director on over 25 successful MRP/ERP projects, many in lean environments. Now focusing on education, he has developed the Lean Performance certificate series offered by the Center for Enterprise Development in conjunction with the Institute for Entrepreneurial Studies at the University of Illinois at Chicago. Lean Performance classes have included teams from processors and manufacturers of food products, power transmission equipment, medical equipment and supplies, large capacity electrical regulators, electrical control panels and regulators, electronic testing services, defense goods and logistics services, automotive transmission and gear castings, HVAC services and equipment, electronic switching components, circuit board products and designs, school equipment, pharmaceutical processing machines, commercial and industrial TV mounts, and chaplets, chills, and perforated tubes. Lean Performance certificate program information and registration materials can be found at: www.ced-uic.com/leancertificate. Mr. Carroll can be contacted at Author@leancommerce.org or visit his Web site at www.leancommerce.org.

I

INTRODUCTION TO LEAN PERFORMANCE

Chapter 1

Foundations of Lean Performance

When the ERP Project Manager Is the Lean Champion

The Mass Production Era of the Industrial Age is now ending and the Lean Production Era is emerging to succeed it. The Lean Production Era is exemplified by processes based in systems of cultural cooperation, differing fundamentally from the Western systems of cultural competition. Outsourcing and offshoring are the latest stages of Western cultural competition and are fueling the expanding shift to Lean Production as great volumes of goods and services formerly produced in Western Mass Production facilities are now produced in Eastern Lean Production facilities.

Ages and Eras are recognized for their social attributes and cultural constructs, not just for their discoveries, machines, and science. The Industrial Age began in approximately 700–800 A.D., when people began to gather in groups (guilds) in the Craft Production Era and to manufacture goods and services. Elements of Mass Production, as well as elements of Lean Production, were visible in the "water-motor" factories that originated in the northeastern United States, beginning in the late 1700s, and were then built in various areas of the country throughout the 1800s. Perhaps the greatest practitioners of "water flow" were the Shakers, who built some of their furniture factories over streams in order to harness water power. The Shakers were a religious community, but they were also pioneers in the "flow" of work. Cultural cooperation and the common purpose of community enabled the Shakers to work in cooperative harmony. One of the last water-powered factories was located in Belchertown, Massachusetts. It was built in the late 1800s and harnessed the power of the Swift River. It burned in 1968, leaving only wreckage that was finally leveled in 1999.

The Mass Production Era bloomed when Frederick W. Taylor, Henry Ford, and others began to utilize the motor-driven assembly line to produce goods and services in mass quantities. The American worker was once primarily an agricultural worker and lived in rural areas. Mass production practices and the onset of mass production factories, beginning perhaps with the meatpacking industries, underlay the mass gatherings of people in burgeoning 20th-century American cities. What the end of the mass production era means is that groups of people who once gathered in large urban settings to work in large mass production factories are no longer viable. Some of them have moved to the emerging exurbia. We are now 50 years into the Lean Production era, with Japanese auto assemblers in the forefront.

The Information Age is a label commonly utilized to describe our current times, but it is not sufficient. This label is analogous to the label "Automotive Age," which recognized the impact of the automobile in post-WWII America. Underpinning the Automotive Age was the greater development of mass production, which enabled the production of not only the automobile but also the great wave of consumer goods that were cheaply mass produced and flooded the American culture, changing it forever. The Automotive Age was made possible by the motor, as, in general, was the Mass Production Era. The water motor was followed by the steam motor, then the oil motor, diesel motor, gasoline motor, and electric motor. The Information Age has been made possible by the advancement of semiconductor and other silicon-based technologies. We are in awe at the proliferation of semiconductor-based machines that enable the use of information in innovations such as the Internet. Although we are still identifying the social implications of the advance of the information machines, we are prone to making pronouncements about the overarching power of information and the semiconductor. History shows us that during the Mass Production Era various approbations were used to overamplify the onset of new innovations: the Age of Electricity, the Telephone Age, then the Automotive Age; in the 1960s it was the Space Age. The Information Age is an epoch in the greater and overarching Industrial Age. Just as the motor (car, assembly line) enabled the mass production era, so does the semiconductor enable the Lean Production era.

It is becoming clear that developing information technologies enable the disintegrated (dislocation) of 100-plus years of mass social integration. The new society that will surely emerge will be one that leverages the product (the information) of the enabler. We will be able to live further apart yet stay in touch. We will be able to disperse more widely into underpopulated regions. We will develop new skills and jobs that provide more or less comfort. It is intriguing to ponder that information technology, to use Thomas Friedman's word, "flattens" the distance between demand and supply, making the demand data immediately "visible" in the flat world. How that will impact the emergence of Lean Production is still difficult to define. The concept explored in this book is Lean Commerce, my take on how networks of lean producers will link in the Virtual Lean Enterprise of the flat world (more on that later).

Why should the ERP project manager be the Lean Champion in the new Virtual Lean Enterprise? A Lean Champion builds a business case that wins management's support and the willingness of management to learn profound knowledge and make profound changes. A Lean Champion begins with his or her own knowledge first and becomes competent at presenting and implementing that knowledge within the organization—on the shop floor and in the office. A Lean Champion starts small and "builds out" by implementing control charting techniques for a work cell, measuring process results and improvements by documenting process standards, and establishing baseline data at a few control points. A Lean Champion posts graphs and uses QCD visual reporting. Finally, a Lean Champion answers the "where is the money" question, communicating upstream as well as downstream as problems and opportunities are uncovered. A Lean Champion who can accomplish these results is an ideal candidate to be a Lean Performance ERP project manager.

Generally speaking, vendor-produced MRP software came on the market in the early 1970s. As the 1970s wore on, the candidates for the MRP project manager assignment tended to be from IT departments. In the early 1980s, the American Production and Inventory Control Society (APICS) led an "MRP crusade" in order to rescue many of the early failed MRP implementations. A body of knowledge began to emerge about MRP and successful implementation. One of the characteristics of successful implementation that was noted from 1980 to 1990 was that the most likely candidate to be successful as the MRP project manager was recruited from the production management staff. A production manager, inventory manager, or other manufacturing manager was recruited to run the MRP implementation, largely due to the necessity to "not mess up the shop floor with that MRP stuff." This continued as the software capability increased substantially and MRP II system implementations began. MRP/ERP project management assignments shifted away from operations personnel in the 1990s, as outside consultants and staff members of IT departments began to dominate MRP implementation teams. As ERP systems emerged, the project management assignments were made almost exclusively from the technical departments. Operations personnel took a back seat as the software became more and more complex. By the middle 1990s, ERP software projects were once again often failing on the shop floor. Lean emerged as a set of principles, tools, and practices on the shop floor, further barricading the operations side of the business from the office. Then came Y2K, and lean interests collided with the reality of the "date" crisis. Operations put in the systems but didn't often get much benefit from them. The battle between the "techies" and the "leanies" was on. We are still in that battle today.

The first theme of this book is that because the ERP system services the flow of goods or services on the floor and in the office, we should select someone who is a process owner or operator from either the shop floor or the office to lead the

ERP implementation. The second theme of this book is that that person should be a Lean Champion and that the ERP implementation should be the primary administrative vehicle from which to implement lean. Lean is the transformative element of thinking in the coming Lean Production Era of the Industrial Age, and knowledge of lean is the paramount human element in this transformation. Knowledge of the particular enabling elements of ERP is important, but lean enabling elements of ERP are at this point in time lagging behind the lean requirements of flow, and a knowledgeable "leanie" knows that. At the same time, thinking that we will advance the activities of Lean Commerce without the computer and other technologies enabled by the semiconductor is just not going to get the job done. Just as lean transformed industrial practices, information technology will transform lean practices. The third and final theme of this book is that lean should be implemented as a project under management, not as a process that is somehow going to transform the enterprise to lean without the direction of management or staff. The benefits of lean transformation are too important to be left to an ad hoc process without project direction.

Much of the Lean Performance project management methodology presented in this book originated in projects that were "reimplementations" of MRP or ERP as I completed numerous projects for enterprises that had done an inadequate job with MRP or ERP, often in emerging Lean Production environments. There are many lean operations that have yet to yield benefits from ERP and also many ERP environments that are struggling with lean. This book demonstrates a middle ground.

It is paramount to incorporate lean knowledge into the management of any ERP project. Lean is colliding with accounting and ERP-based production scheduling in lean environments nearly everywhere lean is being implemented. There are two assumptions that have arisen out of the lean community that must be understood and embraced by the organization attempting to utilize ERP in a lean environment. The first is that a 100 percent buildable schedule cannot be gotten from a computer. Flow based on customers and kanban works better—period. The second assumption can be clearly stated as "We are a manufacturing company, not an accounting company." Everything that is implemented must be in support of manufacturing flow. On the plus side for ERP, lean means Central Data and Process Standards. A standard process cost is a process-oriented management tool for Lean Performance management, much as the product standard cost was suitable in mass management. A lean ERP system contains the information about standard process costs in the formal process routings for your products. Process routings are dynamic reflections of what is actually happening with each production of each product, whether that is a one-piece flow or a larger TAKT-based production lot. Because we still hold some buffer stocks in nearly every lean environment, we need to cost and value those stocks. Collecting and utilizing data to support work instructions is a critical element of a process standard routing. It is the C (cost) in QCD. A Process Standard is a single-level flat structure that incorporates "this run" bill of material data, which includes all activities and material needed to get the part from the introduction process step to the final process step. In a lean environment, we do not report labor to each step; we use the flow time to cost the product. We report only at buffer points. Incorporating individual control points into Process Standard can be introduced when using step-by-step *kaizen* or process-stream mapping to improve QCD.

Lean ERP utilizes process standard data to accomplish *heijunka*, or production smoothing, in a lean environment. Here is where most ERP techies go wrong, however. Although central data that incorporates process time and cost for each part in the system enables the ERP/MRP/CRP calculation results provided to operations TAKT calculations, forcing a schedule further down the system produces the dispatching chaos familiar to most leanies who have suffered the insults of MRP scheduling. Simply put, the MRP schedules do not function on most shop floors and are generally ignored or a source of contention. Later in this book, in the Lean Commerce Chapter, there is a discussion of the mechanics of MRP in a Lean ERP.

The intersection of lean and ERP is at a critical stage as more companies view globalization and the desire to improve operations as the key incentives to invest in ERP. At the end of 2006, AMR Research found that only 43 percent of the companies that responded to their survey reported having ERP already in place. Significantly, 20 percent of the companies reported that they intended to deploy ERP in the coming year. Even more significantly, AMR reports that manufacturers are looking to implement "common processes" across the global enterprise (Managing Automation MA News, 12/28/06). If only these processes were also lean processes. Implementing a single instance of ERP across global platforms is the approach supported by the Lean Performance ERP methodology, and utilizing local "process owners and operators" as the expert implementers of those processes is the approach endorsed by Lean Performance.

American industrialists owned the means of production in the era of mass production. Multinationals own much of the means of production in the global reorganization of production. Lean producers are winning the QCD-driven market share in cars and are building factories in the United States. The new car industry is foreign owned, nonunion, and supplied by lean global supply chains that are often owned offshore. Sustaining American-owned industry in the face of global lean competition makes it imperative for American industry to get lean—now. As foreign suppliers experience the cost accelerators of emerging middle-class workers, the rising offshore wages will add to the current shipping and forecasting advantages apparent in local (U.S.) production of goods. In the end, lean is local. Lean postponement/fulfillment channels are already emerging to take advantage of the cost savings of "final" production close to or in the market that consumes that product. Outsourcing and offshoring are temporary transitory stages in the greater emergence of the Lean Production Era of the Industrial Age.

The Organizational Consequences of Mass Production

A rigid mass production system leads to a highly structured, centralized, and inflexible command and control management system. The management hierarchy in a mass production environment is generally several levels deep. Approvals for changes have to flow up and down this chain of command. Departmental boundaries, not process requirements, determine where processes initiate and terminate, resulting in processes being chopped into inefficient subprocesses. Examples of this phenomenon in most mass production environments include the processes of maintenance, quality, procurement, design and engineering, customer service, scheduling, and shipping and invoicing, all of which snake their way through department after department, in-basket after in-basket, paper queue after paper queue, until they are handed off to completion. While all of this is going on, orders, projects, purchases, and deliveries are expedited, requiring various search missions for paper, negotiations for priority, and the occasional compromise. Managers in the mass production environment are usually more concerned with their departmental objectives than with organizational objectives, which results in the dissipation of energy and resources as their departmental objectives are achieved, sometimes at the expense of organizational objectives.

Rigid production systems in the mass production environment grow into static organization structures and management systems, resulting in an emphasis on maintaining the status quo and choking off innovation. Competitive, low-bid purchasing systems lead to adversarial relations with suppliers. This virtually eliminates the incentive to improve anything, except cost. Customer service is a secondary consideration, limited to fulfilling contracts and warranties. Customer service usually does not employ any mechanism beyond those of desiring or seeking customer feedback on *their* needs, product improvement, effective new product development, ongoing customer relationships, or effective linkage to production. Desiring or seeking input is not the same thing as using that input, or including the customer in improvement efforts. Customer Relationship Management is a technology-driven phenomenon and is often only a vehicle for pursuing customers, not for retaining them through better service. Innovation is focused on product development, *not* process development. This results in the introduction of products that often cannot be efficiently or effectively manufactured with existing production methods, and cannot be supported by information/support processes enabled by available information systems.

In the mass production environment, systematic improvement is usually a staff activity, not a worker responsibility, and is generally performed by industrial and systems engineering technologists. This delegation and misappropriation of responsibility for process quality lead to any number of lost opportunities, eliminating a major source of process improvement: the process owners and operators. The lack of mutual respect in the historically adversarial relationship of the industrial engineer vs. physical process worker results in quality standards that are set to be readily achievable, and they are not continuously improved. This results in low standards (i.e., easy to attain and maintain) and perpetuates the process conditions that caused low standards to be set initially. There is little or no incentive or reward for functional areas to work together to establish cross-functional processes, eliminate delays and improve workflows, balance and synchronize operations, or treat departments receiving products or services as customers. The systems engineering technologists often have the same type of adversarial relationship with the information/support process owners and operators, often with the same poor process results.

Operating systems and reporting structures follow departmental lines of authority. This makes interdepartmental cross-functional processes difficult, if not impossible, to design and operate effectively. Systems and operating procedures are not well documented because there is an advantage in not documenting (i.e., "job security"). If systems and procedures are viewed as not changing, why write them up? Just do it the way we always have. If there is no documented, standard way of operating, it is easier to not be held accountable. Standard ways of operating have not been established in many cases because the transition from craft industry to mass production or small start-up volumes to mass volumes was evolutionary; not explicitly designed on a companywide basis. In many companies existing at the time of transition, or experiencing a "ramp up" of success during the growth stage of the business products and markets, it was more a matter of introducing an assembly line in the production area and adjusting to its impact. In other words, in many environments there never was an explicit process design, or generations of emulation and stagnation have "devolved" the processes even further. Interestingly, the lack of standard operating procedures in the mass information/support processes may be the ultimate impediment to one seemingly successful mass industrial strategy: the cost advantages of volume achieved through interminable mergers, acquisitions, and takeovers. Without standard processes that are understood and documented, the surface cost savings of elimination of personnel in the target company often results in the elimination of expertise and subsequent reduction of the very profitable results predicted by the takeover financial strategists. Lack of Process Standards also leads to poor product quality and safety, recently demonstrated in the rash of "Made in China" product recalls.

Many of the mass production practices developed during the transitional period of early adopters of the Ford and Taylor schools of mass thinking are still predominant today. Not establishing standard ways of operating leaves the worker in charge; it seems to empower him or her but is not in the company's best interests. Management that does not facilitate change derives from the desire to project the idea that the way that we always did it *was* the standard.

Performance measures in the mass production environment primarily reflect departmental and individual outputs, not process performance (except as part of departmental performance). Performance measures are generally focused on outputs, not inputs or throughputs; on cost, not quality (except in meeting minimum standards); and on after-the-fact activities (rework), not preventive measures (supplier quality). Management controls are set to maintain operations within preset limits (i.e., achieving what we have already demonstrated we can achieve). This eliminates the need to improve by looking for root causes. It also eliminates the need to train workers in problem-solving techniques.

Mass production systems incorporate management decision and information/support processes that operate within departmental stovepipe boundaries, not as cross-functional processes and cross-enterprise processes operating across departmental and company boundaries. Cross-functional processes needing lean improvement in most mass production environments include quality management, maintenance, new product introduction, design and engineering, and accounting. Cross-enterprise processes are just beginning to be recognized as the process enabling information technologies emerge. The need for effective design of these processes is apparent in the early meltdown of many of the dotcom pioneers, and the continuing struggles of the "click and mortars" that are reinventing themselves for the Internet.

Finally, the negative characteristics of mass production are mutually reinforcing and interlocking. Owners and top managers in these firms have a vested interest in maintaining the status quo. Middle managers and employees follow suit. They are not given the support, training, or motivation to improve or "lean" operations. Relentlessly, the global competitive beast pursues, and increasingly, leaner is swifter to market and stronger in profit and growth.

The Origin of Lean Production

The Industrial Revolution (beginning around 1750) marked the emergence of the foundations of lean thinking in operational practices such as standardization of methods and materials, interchangeability of parts, specialization of labor, large batch operations, and dedicated machinery. However, these operational practices were only used in manufacturing processes for high volume products (e.g., rifles by Eli Whitney). Lean practices were in a very rudimentary state, and craft-based manufacturing practices dominated industry. The now-recognized cultural and transformational principles of lean were not codified. The lean enterprise was still a long way off, in fact, about 200 years.

Henry Ford provided the first industrial firm, his 1913 automobile assembly plant, that can be accurately called lean. However, his plant was a very limited case of lean operations, retaining many mass characteristics. For 12 years there was no product change (only the Model T was produced from 1915 to 1927). Only the main assembly line and key subassemblies were lean, and only with respect to some of the eventually defined lean transformational principles such as value, value-added, and flow. Other operations (e.g., parts machining and fabrication) were still job shops. Cohorts of middle management and emerging staff positions (e.g., in industrial engineering, tooling engineering, maintenance) plus a large production clerical staff controlled operations. Non-manufacturing operations, such as accounting, were grudgingly considered necessary by Ford and received very little attention. Limited as lean operational practices were, the Ford Model T plant was a value-added flow process that revolutionized manufacturing. Ford later expanded on his lean achievement by developing the Rouge River plant, long considered the inspiration for the Japanese lean manufacturers, who toured it extensively. Finally, in the early days after the Japanese attacked at Pearl Harbor, Ford assembled the project team that implemented what is now recognized as the world's first lean flow facility: the Willow Run B-24 bomber assembly facility. The industrial system designs pioneered at Willow Run were cloned at numerous aircraft assembly facilities during the following two years. No less an authority than Joseph Stalin of Soviet Russia had this to say about the aircraft output achieved by these first lean industrial factories in the world: "From the Russian point of view...the most important things in this war are machines. The United States has proven that it can turn out from 8,000 to 10,000 airplanes per month...Without the use of these machines, through Lend-Lease, we would lose this war" (Tehran Big Three Conference, November 1943; from Meacham, Jon, *Franklin and Winston* Random House, New York, 264, 2003).

So, what happened? Imagine a transition from the greatest industrial achievements seen in history to the abandonment of lean practices almost immediately following the cessation of World War II (except by Toyota, but that's another story). Tellingly, the abandonment of lean began before the war but this abandonment wasn't noticed in the War Department run and TWI (Training Within Industry)-enabled factories producing war goods, including converted Ford automotive factories. Defense culture *was* lean culture. Let's step back and see where early lean culture in U.S. industry began.

Here are the primary elements of the cultural policies deployed by the pioneering company of lean:

- To give to the employees of the company $10,000,000 of the profits
- To establish a minimum wage scale of $5 per day
- Not to discharge any man except for proved unfaithfulness or irremediable inefficiency
- If obliged to lay men off, to plan our year's work so that the layoff shall be in the harvest time: July, August, and September, not in the winter

If you were thinking this is the Toyota charter, you're wrong. On January 5, 1914, Henry Ford, head of the Ford Motor Company, announced these policies. He was supported by James Couzens, treasurer of the Ford Motor Company, who stated, "Social justice begins at home. We want those who have helped us to produce this great institution and are helping to maintain it to share our prosperity. We want them to have present profits and future prospects."

By the mid-1930s, these policies were abandoned under the firestorm of pressure created by management labor strife. What went wrong has been the topic of other books, and I will not attempt to present that story here. It has to suffice that

Ford abandoned lean cultural principles and the cultural policies and strategies that those beliefs had engendered during the period of gathering market presence for Ford products.

Perhaps most critically, as commitment to lean culture fell away, Ford did not incorporate the essential lean cultural principles of process orientation and ownership later adopted by lean manufacturers. Ford workers were primarily unskilled and uninvolved, reduced to “a pair of hands.” The early industrial battles and seeds of management/labor suspicion and distrust were sown in the autocratic “man as machine” industrial engineering practices employed. For all of that, Ford’s mass production methods were widely emulated and viewed as the crowning achievement of U.S. industry in 1955 at the peak of Ford’s dominance and success.

Lean, as it was refined at Toyota, is the result of practical engineering applied to low-volume requirements in a desperate economic circumstance by individuals who needed everybody to help with the effort to produce and therefore survive. There are other opinions. Some are based in the observation of Toyota today and speculate on the existence of an overarching design to Toyota. Certainly, Taichii Ohno observed the American supermarket and derived many good inventory management ideas from it. It is generally agreed that he learned about flow at the Ford Rouge plant. Pronouncements that speculate that Toyota was able to calculate the final result of decisions taken in an era when decisions about production methods were made almost exclusively on the inability to emulate mass production (lack of material, lack of availability of multiple presses, or lack of tools) ignore the fact that lean tools were derived from the Training Within Industry materials. Also, Toyota’s lean practices emerged from 1950 to 1970 while Toyota solidified product quality. It is more accurate to say that economic emergency was the root cause of lean at Toyota.

The Toyota Production System is more accurately termed the Toyota Management System, and it is constructed on the foundation of process-oriented thinking. Process-oriented thinking is the cultural principle that is the basis of the lean management, information/support, and physical production processes that are the heartbeat of Toyota’s success.

It is also accurate to note that lean isn’t the only business management or production strategy in Japan. The argument about the best managed company, best management system, and best production strategy should really be made and settled on what the results from that management and production strategy are. It appears that the best managed company is Toyota, from a performance measurement standpoint. Toyota is lean. The Toyota Production System (TPS) is a lean business management and production strategy that results in superior product and financial results.

Lean works, because it works for Toyota. Therefore, if lean doesn’t work for you, it’s because of you. But even Toyota has setbacks. Toyota has experienced a decrease in inventory turn during this period of accelerated global expansion. Don’t count on it to continue. As Toyota expands vehicle production to surpass GM as the world’s largest automaker, the necessity for local lean component suppliers in foreign markets (like the United States) is imperative. It has turned out to be a more difficult task than first imagined by Toyota planners. Toyota's inventory turns really have fallen—but not because its individual plants are less lean. Rather Toyota's turns have fallen because of the steady global expansion of Toyota: building a lean global supply chain isn't easy. Shorter supply chains support higher inventory turns; longer supply chains require lower inventory turns—lean is local. It is important to note that as auto volume shifts from the Big 3 to the J-3 (Toyota, Honda, Nissan) a once-in-an-era opportunity presents itself to those auto component suppliers who are able to meet Toyota supplier requirements and obtain business from Toyota and the other members of the J-3.

When World War II ended in the Pacific, the victorious Americans began to put in motion the new governmental and social mechanisms that assisted the Japanese in their re-emergence in the world economy. The practices utilized in WWII production systems, including TWI (Training Within Industry) and the flow production systems of the defense production facilities, were heavily implemented. Meanwhile, back in America, the emerging MBA/military bureaucracy style of elite workplace principles and practices rose to prominence. It was almost as though America collectively forgot how the war had been won. Soon, there were indicators that not all was well in the mass production economy.

After the 1950s, the limitations of mass production practices became increasingly evident. Mass economics dictated that mass production practices include long production runs. Expensive tooling requiring longer and longer setup support and dedicated machines were economically feasible from a ROI perspective only by utilizing ever-expanding EOQ production lots. Large finished goods inventory resulted from pushing product down the pipeline, and large inventory could be found at several stages, including at the dealers, be it automobiles, TVs, or refrigerators. Mass production inventory management practices were not responsive to changing customer demand, and inventory build and drain cycles did not respond well to fluctuating or shrinking customer order patterns. A pattern of boom and bust emerged, with economic cycles tied, seemingly inextricably, to the vagaries and ebb and flow of the inventory position. Lay off and rehire, not train and retain, became the ready solution. Low quality standards and large equipment sunk costs reduced the incentive to adopt new technology. High wages and rigid work rules began to dominate increasingly contentious labor/management relationships.

In contrast to the operational practices of Ford and other mass producers, lean emerged as a new way of organizing and operating industrial firms. Lean was pioneered at Toyota in Japan by Eiji Toyoda and his production genius, Taichii Ohno, primarily after World War II. They began a series of experiments and innovations that has sparked nothing less than a global transformation in manufacturing that accelerates each year.

The increasing success of Toyota and other lean automotive assemblers did not go unnoticed in North America and Europe, although unshakable faith in U.S. mass manufacturing practices made it difficult, if not impossible, for some mass producers to learn from the lean pioneers and survive. By the early 1980s, clearly "something" had to be done.

One key response in 1984 was the formation of the Massachusetts Institute of Technology International Motor Vehicle Program at its then newly formed Center for Technology, Policy, and Industrial Development. A broad study of emerging manufacturing practices was undertaken.

> We [Womack, Jones, Roos] felt that the most constructive step…would be to undertake a detailed study of the new Japanese techniques, which we subsequently named Lean Production compared with older Western mass-production techniques, and to do so in partnership with all the world's motor vehicle manufacturers. (Womack, James P., Jones, Daniel T., and Roos, Daniel, *The Machine That Changed the World*, Rawson Associates, New York, 4, 1990)

In all, 90 automobile assembly plants worldwide were included in this study. What results from making a successful lean transformation were uncovered? One comparison of Lean* vs. Mass Production cited in the study:

	GM Framingham	*Toyota Takaoka*
Gross assembly hrs. per car	40.7	18
Adjusted assembly hrs. per car	31	16
Assembly defects per 100 cars	130	45
Assembly space per car (sq. ft.)	8.1	4.8
Inventories of parts (average)	2 weeks	2 hours
Womack, Jones, and Roos, *The Machine That Changed the World*, 81.		
* Lean vs. mass instead of Japanese vs. U.S., both systems have spread globally.		

What Is Lean Production?

Lean Production is the name that was given to the management theory containing the assorted lean practices documented by MIT during this five-year study of automotive assemblers and suppliers worldwide. The results were documented in the book *The Machine That Changed the World*. Even before this groundbreaking study, the emerging "Japanese manufacturing practices" literature had begun to define lean producers as being superior in manufacturing practices, especially in the overriding lean manufacturing phenomenon of continual or continuous improvement in the physical process workplace that was driven by the production workers themselves. Some felt that the phenomenon of worker involvement in continual suggestion and implementation of cost-saving and quality-improving practices could be copied, and several useful ideas were adopted, including Total Quality Management. Others felt that the involvement of the worker was a cultural phenomenon and that it couldn't be implemented in the United States.

In essence, Lean Production is the philosophy of eliminating all waste in all system processes continuously. The system is the complete set of processes required to produce the product. In Lean Production, every action that is taken to improve processes is planned, implemented, and evaluated in terms of the overall goals of the system.

To be lean in production is to have eliminated waste in all its forms, including but not limited to:

- Operator time
- Materials
- Techniques
- Inventory
- MTM (methods/time/motion)
- Space required
- Facilities required
- Cycle time
- Equipment
- Rework/rejects/scrap
- Tooling and fixtures
- Set up
- Waiting time
- Downtime
- Distance traveled by a part

Most lean firms have already implemented any number of lean operational practices, including:

- Cellular production
- U-shaped cells
- Cell design and layout for flow
- SMED—single-minute exchange of die, internal versus external setup
- Work group/team error proofing
- ZD (zero defects)
- Station and operation process control
- Sending only what is needed
- Error proofing (poke—yoke)
- Part conveyance between stations
- TAKT time
- Kanbans

- Level loading
- Small lot production
- One-piece flow
- Balanced flow
- Synchronous flow
- Mixed-flow lines

Lean firms have also implemented lean human resource practices, designed to eliminate the conflicts that emerged between mass production wage systems and lean operational practices, such as:

- Pay for performance wage systems
- Productivity group bonus systems
- Payment for ability
- Developing and rewarding multiple skill operators
- Multifunction operations and skills matrices
- No layoff job sharing and hours available practices (work sharing)

Some terrific books have been published on these topics and on the phenomenon of lean in physical processes. It is not my purpose to re-state them. Rather, I am going to investigate the use of lean principles, tools, and practices to implement processes enabled by information technology utilizing a lean methodology designed to enable the "Virtual Lean Enterprise."

Why Aren't More Firms Lean?

After more than 40 years, many of us still do not believe that Japanese industry developed a production system superior to our mass production system. We have become willing to grant that Japanese quality, until recent U.S. industry improvement, was superior to U.S. quality. Unfortunately, many of us also believe that rigorous applications of lean quality practices have passed the point of diminishing returns; for many, quality has become an expensive obsession. Some of us believe that quality is always increased at the expense of productivity and that we can improve quality while keeping our mass production system and, to some degree, even in the emerging lean U.S. operations, we have. We also believed that we would meet QS or ISO 9000 requirements, but that it was just more bureaucratic red tape. Many of us believed that QS and ISO certification were just top management's latest flavor-of-the-month gimmicks, and we treated them that way, expensively documenting the procedures that most agree represent only how we would like to do things, not how we actually do them. We have felt that quality was an option, not a necessity, and "making production" was the ruling motto of our production world. As a result of these beliefs, we often pursued superficial improvements in quality, without a thorough and critical review of our production system.

The way we receive and use information from Japan has not helped the situation. We receive information in "bits and pieces," a lean tool or lean practice at a time. We hear about the results, not the *process* of using these tools and practices in differing circumstances and cultures. Then, to make matters worse, U.S. consultants often give the Japanese approach their own spin, thus losing the key ideas in transition. U.S. management and engineering schools continue to focus on U.S. mass production practices, with only passing reference to the lean practices. In some instances, lean practices such as flow or cellular production or kanban signaling have been implemented by industrial or manufacturing engineers, who see these practices as the harvest of lean thinking. What they are not seeing is that the origin of these practices, and their effective application in any environment, is in the underlying power of the cultural principles of process ownership and respect for workers' knowledge. As a result, we pursue superficial improvements in production or expensive investments in technology innovation, again without a thorough and critical review of our production system, including our management decision and information/support processes.

Prior to the MIT International Motor Vehicle Program study previously referenced, we did not have a comprehensive, in-depth understanding of the Lean Production system. In fact, Womack, Jones, and Roos did not publish *The Machine That Changed the World* until 1990, more than 40 years after Toyota began its journey to become lean! As a result, many firms have tried a superficial approach to becoming lean, primarily by applying lean practices such as SPC, JIT, etc. But now this tactical approach to lean is inexcusable, because we know what it really takes to become lean.

There are formidable barriers to lean thinking in most U.S. firms, including a not-invented-here attitude that asks how lean firms can have better production systems than we do. Many of us still believe that the lean principles, tools, and practices are gimmicks that can't possibly yield such great results. Our management performance measures retain a fixation on mass production volume cost thinking, including results-centered analysis and decision making, without process awareness or understanding. We revert to the quick fix attitude, "flavor-of-the-month" styles at a moment's notice, especially when those notices are red layoff slips. We emphasize machine utilization, only sporadically do we utilize zero inventory or pull or JIT or any number of other lean practices that, implemented in isolation from the principles and tools of lean, rarely work. We cling to the belief that other countries use low-cost labor, government aid, sweatshops, exploitation—anything but superior Lean Production systems.

Occasionally, we express a widespread feeling that managers, not the employees, have the answers. In the recent low unemployment labor market, we have developed the view that there are not many good people out there to hire anymore.

For many of us, we share the belief that loyalty is a thing of the past. Some other self-defeating beliefs:

- Lean may be good, but I know of some *fat* firms that are making tons of money.
- Computers are the real answer.
- We want to get lean but our union won't let us.
- I will only be eliminating my own job.
- What I know is my job security.
- All these improvements add up to zilch, our real problem is [yours here].
- We have always done it this way, why change now?
- Relax, this is just another one of management's flavors-of-the-month.
- What we are doing is good enough.
- It never hurts to have a cushion.
- Everything is going to China anyway.

The main philosophical points that I hope to make in this book are these:

- Lean principles, tools, and practices can and should be applied to all processes.
- Utilizing the tools and practices of Lean Production without adopting the lean cultural and transformational principles is analogous to painting over rust: you haven't really changed anything, things just look nicer (for now).

What Is Required to Become Lean?

It is an appropriate baseline to assume that many manufacturing firms are familiar with the principles, tools, and practices of Lean Production. Many firms have some lean physical processes. But, getting lean requires that everyone participate. Most lean firms struggle to transform their information-based processes, and their physical processes that are supported by information, into lean processes. At the same time, other companies are learning to use lean principles, tools, and practices to transform into lean enterprises. They are learning that getting lean requires fundamental adjustments in thinking, attitudes, and behaviors; it is not simply the acquisition of another set of tools and practices. It is also the adoption of a new set of transformational and cultural principles. The lean transformation is a continuous, never-ending, incremental process. The project approach presented here is no more than a good start.

First, consider some standard but often ignored factors necessary to a successful lean transformation:

- Management commitment to becoming lean
- Involvement and participation by *all* employees
- A team approach

- A long-run view, a year or more, for starters
- Assignment of responsibilities and tasks to teams on a project basis
- Lean assignments incorporated into each employee's job on a daily basis
- Education and training at all levels

Second, a major change in attitude is needed, realizing that the lean approach embodies utilizing a set of diagnostic tools as well as an integrated and systematic approach to using those tools to operate the business, built on the foundation of cultural and transformational principles.

Last, but not least, a company lean vision, mission, strategies, policy deployment, processes, and systems and standards is needed that incorporate lean principles and practices.

The physical operations processes are generally "leaner" in the emerging Lean Production systems and lean companies than are the management and information/support processes, because they have received the initial focus. From a Lean Performance perspective, a company can be considered lean when it is designed, organized, and operated according to cultural and transformational lean principles. The lean cultural principles presented here are derived from the lean literature that is the foundation of Lean Performance. They include:

- Process-oriented thinking means what before how.
- Product quality results from process quality.
- Every process needs a process standard.
- The process owners and operators are the process experts.
- The next process is your customer.
- Loyalty to people enables continuous improvement.
- Process data and measurements drive process continuous improvement.

Cultural principles can also be thought of as "common beliefs" held and followed by those in a community, such as a corporation. Cultural principles are the foundation for the application of tools and practices within a community. Without the adoption of lean cultural principles, the application of Lean tools and practices is impossible. Perhaps the most important of these lean cultural principles is also the most difficult for most Western companies (and managers) to adopt. "The process owners and operators are the process experts" carries the entire paradigm of change to lean.

The cultural belief about employee education is the defining change value needed to develop lean corporate culture. Lean is 100 percent different from Mass, and nearly all elements of workplace tools and practices will change from mass characteristics to lean characteristics during a lean transformation. Although some may read the books, attend the seminars, and compete for the project opportunities to be involved in the lean transformation, many in the workplace will not. The company will have to direct the workers toward the education needed, and provide the opportunities and funding. In the United States, a company-sponsored education path is not common; Americans design their own education path just as they design their own career path.

The lean transformational principles presented here are those presented by Womack and Jones in their follow-up to the aforementioned *The Machine That Changed the World*, their 1996 publication, *Lean Thinking* (second ed., 2003):

- Precisely specify value by product or family.
- Identify the value stream for each product.
- Make value flow without interruption.
- Let customer pull value from process owner.
- Pursue perfection.

The Lean Performance methodology is primarily directed at those organizations that are well along the path to lean in the physical processes, and perhaps in some cross-functional processes as well. Lean Performance recognizes that changing or transforming a mass production system to a Lean Production enterprise requires that three things happen:

1. A comprehensive leaning of processes based on recognition of processes within process areas
2. Leaning of the cross-functional *process organization* of the manufacturing enterprise
3. Leaning of the cross-enterprise *process partnerships* of the extended or Virtual Lean Enterprise, the lean supply chain

It seems reasonable to assume that in order to get started on the journey to the lean enterprise, you must know where you are now. Should your firm embark on a Lean Performance project, the key tasks of the planning phase are to identify all company process areas, all processes within those process areas, all process owners and customers, cross-functional processes and linkages, and cross-enterprise processes and linkages. I will provide a comprehensive structure for performing these tasks and the tasks that follow in this book.

Chapter 2

Extending Lean Performance Foundations

Implementing Lean Cross-Functional Processes

The success of the early adopters in applying lean principles, tools, and practices primarily to production/operations physical processes is in large part because the barriers to lean improvements in these process areas are contained within only one or possibly two "stove-pipe" bureaucracies. The cross-functional processes that have undergone lean improvements in some companies implementing Lean Production systems include:

- Lean quality management
- Lean maintenance
- Lean new product introduction
- Lean design and engineering
- Lean accounting

Employing lean principles, tools, and practices in these processes provides an opportunity to apply lean principles within processes as well as to link several processes in a lean flow. In lean systems, the focus is on improving the organization into a set of interlocking, interdependent lean processes. Without an organization-wide lean process perspective, any lean process can be rendered inefficient and ineffective by being linked to or constrained by an upstream or downstream process or processes operating with a traditional mass production (nonlean) design. The next challenge on the path to achieving a truly lean enterprise is to attain lean linkage and flow between all organization processes, including management, information/support, and physical processes. Often, however, even in companies experiencing success in the transformation to lean of these first five cross-functional processes, they generally are not effectively supported by information systems, or the information systems supporting them are not based in integrated systems and central data. I will discuss these processes further in this section, defining the outline of process requirements for these processes from a lean perspective. I will eventually assign the task of improving them to specific cross-functional teams in the project.

Implementing lean cross-functional processes begins the multilevel analysis of processes that is necessary to complete the lean transformation at the organizational level in a manufacturing firm, and it points the way to developing cross-enterprise lean processes throughout the Virtual Lean Enterprise.

Two important objectives are accomplished by implementing lean cross-functional processes. First, this activity develops an understanding of how mass production principles impact organizations. Second, the activity develops an understanding of a manufacturing organization as a stream of *lean-able* processes contained in definable process areas, such as design, engineering, etc.

Advocates of continuous improvement may ask at this point, "Why do we need to move to these other levels of analysis? Why can't we just continue at the individual process level? It seems to be working well so far." There are three major reasons for a broader approach to the leaning of cross-functional and cross-enterprise processes, especially those enabled by information technology. First, the design and operations principles of mass production are so deeply embedded in our manufacturing firms at all levels that they preclude a successful lean transformation, unless they are eliminated. Second, lean processes do not and will not automatically link themselves in a Lean Production system operating on a companywide basis. These cross-functional linkages, operating systems, organization structures, and external relationships all need to be improved intentionally, from a lean perspective. And, last, lean processes do not easily link themselves in a Lean Production system operating on an enterprisewide basis. These cross-enterprise linkages, operating systems, organization structures, and external relationships are the final frontier of the lean transformation.

To identify the primary lean requirements of cross-functional processes, several problems must be overcome. These processes span organizational units (divisions, departments, sections, companies) but require improvements that reinforce lean principles and practices unfettered by organizational units. Leaning these processes requires changes in operating systems and organization structures.

Cross-functional processes pose several other design problems for firms attempting a lean transformation. They require a new approach to external relationships (primarily suppliers and customers). They can emerge into cross-enterprise processes and will be considered the precursors of the cross-enterprise processes assigned to the project teams. They require realignments of managers, staff, and workforce.

In order to expand the application of lean principles, tools, and practices more widely in an organization, cross-functional processes require explicit elimination of two barriers that are much easier to overcome in the narrow stovepipe of production operations (not that these obstacles were always easy to overcome there, either).

The first barrier includes the impediments to a lean operation caused by organizational boundaries (i.e., divisional, departmental, or company). Examples of these include interruption of flow (paper, data, information), administrative "turf battles," waiting for authorization, nonconformance to standards, bottlenecks, scheduling problems, lack of training, and lack of feedback and feedforward among and between processes.

The second barrier incorporates the process "linkage" issues: how processes are linked through a set of operating policies and reinforcing mechanisms, such as transfer of personnel, cross-training, location, information flows, and physical equipment such as tote boxes, flat trucks, and so forth.

Lean Quality Management

As mentioned earlier, in spite of the barriers, several cross-functional and cross-enterprise processes have been "leaned" in many emerging lean enterprises. Chief among them are the quality management processes. "Quality" is often defined as the meeting of standards (specifications or tolerances) at an acceptable level of conformance. This acceptable level is variously defined: for example, as zero defects, Six Sigma, Lean Six Sigma, defective parts per million, etc. Quality management, not quality control or quality assurance, is the appropriate term to convey that the goal of achieving and improving quality is an area of management concern and responsibility. Most companies with Lean Production systems have developed quality management systems by following three lean business policies:

- Pursuit of quality is a strategic company goal.
- Top management is committed to and actively involved in achieving quality objectives.
- A permanent, organized companywide effort to continuously improve product process quality, including training and measurements, is maintained.

In lean quality management, there is an understanding and acceptance of quality as a central tenet of the organization's lean business policies and strategies. Managers, staff, and workers are trained in lean quality management tools and practices, including the lean diagnostic tools of the 3 MUs, the 4 Ms, the 5 Ss, and the 5 Ws-1 H. Process owners and operators are considered process experts, and the cultural principles of lean have been adopted, at least as they relate to quality.

In a Lean Production system, both the "standard" and "acceptable" level of conformance is continually improved. In a lean enterprise, quality management practices are implemented across the supply chain in order to continually improve the "standard" and "acceptable" level of conformance to quality standards. In a lean supply chain, quality applies to inputs, throughputs, and outputs of all processes. *Incoming* goods are certified by the supplier, not inspected at the receiving dock. Essentially, quality is the supplier's responsibility. *During* the production processes (throughput), interim outputs are operator monitored for quality, whether machine *or* manual process, not just after completion. *Output* is always monitored for quality to determine if and how a process produced defective product, *not* merely to identify acceptable product and weed out or rework defective products. In the Lean Performance project, leaning the quality management process is assigned to the Operations Team.

Lean Maintenance

In many Lean Production systems already functioning in Western companies, maintenance processes are designed, organized, and managed according to lean principles and practices, with empowered physical process workers using lean diagnostic tools to continuously improve the maintenance of their own process and process enablers. In concert with engineers, supervisors, and machine experts, these cross-functional maintenance processes, including operator-oriented preventive maintenance practices, eliminate production problems such as unscheduled machine downtime, failure to meet quality standards, and machine failure or other mechanical trouble that causes an operation to fail to meet process capabilities and requirements.

In a Lean Production system, maintenance processes are also considered in equipment purchase, and new product and process design decisions to ensure that maintenance problems do not contribute to inefficient and ineffective operations during later production operations. It is not enough to simply regard maintenance as necessary to the smooth functioning of production. It is also a major cost center in manufacturing firms and has a major impact on quality, cost, and delivery. So why wouldn't we concentrate on the quality of these processes? In a Lean Production system, maintenance processes are identified, standardized, and made the responsibility of production personnel. Each machine operator is trained in how to use his or her machine properly and in how to clean, oil, paint, and otherwise maintain equipment according to maintenance, operating, and quality standards, as an extension into the use of the lean diagnostic tool of the 5 Ss.

Lean maintenance processes enable maintenance problems to be detected and addressed as soon as possible, through preventive maintenance as well as by operator inspections based on cumulative run time or a periodic schedule. In lean maintenance processes, maintenance and performance records are kept on all major pieces of equipment. These records are used routinely and cross-functionally by maintenance management, production management, and, periodically, top management, to ensure lean operations. Records maintained include Lean Performance standards (i.e., lost time, defects caused by maintenance issues, safety, delays, breakdowns, and so forth). In lean maintenance processes, all maintenance activities are scheduled, whether they are routine maintenance or major equipment overhaul. Schedules are observed to ensure minimal unplanned, emergency, and reactive maintenance (all more costly and disruptive to customer delivery than scheduled downtime). These lean practices result in a smooth flow of production, incorporating planned downtime coordinated with production schedules. One challenge for the Lean Performance Information Team in the project will be to examine its system maintenance responsibilities from a lean perspective. In the Lean Performance project, responsibility for leaning the maintenance process is assigned to the Operations Team.

Lean New Product Introduction

A lean new product introduction process includes all activities that contribute to new product development (i.e., marketing, research, development, design, product engineering, process engineering, procurement, operations, suppliers, distributors, and customers). This process is the lean cross-functional and cross-enterprise frontier in many emerging lean environments, because the use of enabling information technologies, not the least of which is the Internet, has driven a corresponding need for the establishment of standard protocols of data transfer, interface, and management.

Benefits of a lean new product introduction process include increased communication, better teamwork, and, especially, concurrent versus sequential ("over the transom") development of products. These lean practices have resulted in reducing costly reengineering, limiting off-target product development, and discouraging process disconnects and turf battles during the development of products for what are increasingly brief product life cycles. Other benefits include increased productivity and improved quality through better manufacturability of products that have been designed, through an inclusive approach that incorporates the knowledge of all team members, with both production capabilities as well as production constraints factored in. One of the important tasks for the Lean Performance Engineering Team will be to examine the opportunities present to apply concurrent practices within information/support processes based in the project information technology enablers, as they are assigned the responsibility for leaning the new product introduction process.

A lean new product introduction process generally requires assignment of personnel to a new development project for a product for as long as the development project for that product continues. A lean new product introduction process requires a career ladder based on new product development, with performance evaluations that specify development tasks used in evaluating and assigning personnel. These tasks relate to factors beyond the department or functional responsibility, but rather to the individual's contribution to product development projects (i.e., those relating to process responsibility). A lean new product introduction process is not ultimately controlled through a coordinator, committee, departmental manager, or matrix management (although these organization techniques may prove useful as support mechanisms). Rather, the lean new product introduction process is generally "owned" by a new product development manager with full authority and responsibility over the life of the project. Lean Performance steering committee responsibilities during the project, and Lean Performance management responsibilities after the project, include the definition and administration of human resource policies and structures that recognize and support the requirements of lean process management.

Lean Design and Engineering

A lean design and engineering (D&E) process maintains products that have been designed and engineered for the processes that produce them. It should be obvious, but isn't always accepted, that products designed and maintained without attention to manufacturing capabilities cannot be produced efficiently or effectively. Product and manufacturing engineers need cross-training on their respective capabilities.

Rather than a sequential linking of discrete processes, a lean design and engineering process consists of concurrent (overlapping) organizational and activity processes in research and design, product engineering, manufacturing engineering, and manufacturing operations management.

A concurrently linked lean D&E process provides a vast number of benefits. First, the usual errors based on faulty assumptions or misinformation about downstream capabilities are detected as the product design progresses. Downstream processes are empowered to prepare for new demands on their capabilities in a timely fashion, because they are included early on. Necessary changes, including equipment or tooling, can be incorporated in subordinate processes before production deadlines prevent an effective deployment of new capabilities, many of which were factored into the cost justification for the product introduction itself. Intended operations efficiencies that are not realized when the product is manufactured can cause profit targets to be missed. Mass production design and engineering processes often lead to the "we'll learn how to make it as we go, and then we'll make our money back" approach. Of course, this doesn't work very well in a global competitive marketplace where there are increasingly short product life cycles. A penalty of mass processes in the emerging short-cycle world is if your design and engineering process has a mass "throw it over the wall to production, and we'll figure out how to make it out there" cost dynamic, even with a successful product there may not be enough of a product life to make your money back.

Implementing a lean D&E process demands that all tasks be critically examined from a team-based lean perspective because D&E staff traditionally operate with varying degrees of autonomy. The full list of processes necessary to fulfill the customer order, including cost, quality, and delivery realities, is not always uppermost in staff minds. Lean principles and practices that are viewed as good for plant operations and personnel are not always viewed by engineers as necessarily applicable to engineering. Professional objectives may take precedence over company objectives. The introduction of information technology into these processes, and the need for these process owners to support an enterprise system, can also be problematic. Engineers may prefer to build their own systems, in isolation from the processes and data relied on by the rest of the enterprise. Not only does this cause difficulty in data integrity, but also these separate systems are forever on a different and often highly modified or customized development and support path.

A lean D&E process links D&E to other process areas effectively. This linkage ensures that poor communication, lack of information transfer, and uncoordinated schedules are minimized or avoided altogether. Lack of cross-functional inputs for maintenance and operations processes and for equipment purchase planning and installation can also be avoided, with great benefit.

When D&E processes are monitored by top management from a lean perspective to anticipate and avoid delays in production, the primary benefits are the detection of product specifications that cannot be met by production processes, the elimination of product features that are not required by customers, and the avoidance of the corresponding time delays to incorporate those specifications or features. The D&E processes for the project are assigned to the Lean Performance Engineering Team.

Lean Accounting

Accounting in the emerging lean enterprise has two objectives: to develop accounting processes and practices that are lean, and to support lean management in and throughout the enterprise.

The process of applying lean principles, tools and practices to accounting processes is begun by utilizing the lean tools of 3 MUs, 5 Ss, 4 Ms and 5 Ws-1H to remove waste from current processes. The Lean Performance analysis that is utilized in the Lean Performance project methodology begins with these tools and expands the effort to include an SDCA/PDCA tool that further reduces waste while completing process standards for each process. Once the transition to lean processes is accomplished, and lean process standards are in place throughout the enterprise, use of material information flow analysis (MIFA) practices such as process stream mapping can be utilized to link lean improvements across processes that operate in multiple process streams.

While learning how to forecast the financial impact of lean on the financial statements, accounting and financial management must develop a game plan to implement lean accounting overall while rigorously adhere to generally accepted accounting principles, GAAP, and external reporting requirements and regulations, including Sarbanes–Oxley (SOX). Lean accounting practices strengthen internal accounting controls while replacing "control by transactions" with operational controls and visual management reporting. Many transforming enterprises utilize a "transactions matrix" to match transactions currently being performed to the processes that report, consume, or measure these transactions. Knowing which transactions are being eliminated, or can be eliminated, assists the enterprise to get lean while maintaining appropriate financial controls. A benefit to all is that as the enterprise expands into the use of lean processes and practices, the transactional controls imposed in the mass enterprise are removed in sync with the transformation.

A few last notes on transaction controls: don't surprise your auditors with your new lean processes and visual controls and reports. Auditors generally don't like surprises. Be sure to meet the SOX regulations by including SOX requirements in the process workflow standards that are developed in the Lean Performance project. Process workflow standards are accepted tools that can be utilized to highlight SOX risks and the changes that can be implemented through various process improvement activities (*kaizen*/process stream mapping) to lower risk.

While reducing waste in their own processes, accounting can begin to support lean management throughout the enterprise by learning how to partner with the manufacturing and service processes that actually provide value to the customer. Lean accounting is actively concerned with understanding the value-creating processes and proactively working to enable lean processes in customer relationship management, new product introduction, and the other critical processes in the enterprise. Accounting transforms to a service center in the lean enterprise, not an impediment as formerly viewed by much of the value-creating processes in the mass enterprise.

The great first fact of lean accounting is that inventory has no (or negative) value. A well-run lean flow takes no annual inventory. The WIP is flushed into product as buffers are consumed. Accounting and finance have adjusted the fiscal year to balance to zero at the critical low trough of customer demand. The need for perpetual inventory records is replaced with simple visual controls for what little inventory remains.

Lean accounting utilizes "plain English" to explain and report financial results, including statements and a "one-day close" to flow financial information back to decision makers rapidly. Financial reports are straightforward, not cluttered with abstract formulas and calculations such as "absorption" and "COGS." Financial and performance results are presented visually on whiteboards or by other visual means by reporting process area, work cell, operating entity, or division (or another meaningful structure in the enterprise). Participants from other process areas are now able to provide ideas and solutions rather than sit in formerly boring meetings in baffled silence. There is an emphasis on process performance measurements: process-oriented thinking is now the norm and the process owners and operators are supplying process-based improvements to accounting for assistance in conversion to EBITDA and other "results" measures. "Scorecard" presentations are utilized to recap financial results. Some financial reporting is developed and presented utilizing the "Box Score," a single-sheet summary similar to Scorecard but also containing operational and capacity performance in addition to financial information. The Box Score can also be utilized to provide information for decisions concerning sourcing, make/buy, and quotes.

One lean accounting practice that is actively being applied in lean environments that are process stream–oriented is process stream accounting as a replacement for standard costing. If the process stream organization fits your lean enterprise, process stream income statements are a common lean accounting practice.

Another practice being utilized to support lean costing is process standard cost, a cost method that isolates individual products and their process standards to track actual cost. One fact is clear: a lean enterprise eliminates standard costs (or other full absorption cost methods) for decision making like quoting, pricing, make/buy, capital expenditure, etc. The recognition that product standard cost is insufficient and leads to poor decisions is a profound moment in the transition from mass thinking to lean thinking. Accepting that mass thinking leads the enterprise to turn down profitable work, causes the enterprise to attract unprofitable or less profitable work, and leads the enterprise to outsource parts that can be made profitably by utilizing lean methods in-house is a serious indicator that lean accounting has taken hold.

Another prominent lean accounting practice is the use of Target Costing as a concurrent process element of new product introduction. Target Costing is utilized to determine the market possibility of a product being developed. Knowing the MUDA-free process cost of a product enables the analysis of customer and market potential to be conducted with a clear insight into profit potential. Participants in target costing include sales and marketing, product design, operations, inventory and logistics, and other process areas in the process stream in your enterprise.

Sales and Operations Planning (S&OP) is an integral element of Lean Commerce, and accounting has an important part to play. Each month as the S&OP process is completed, sales and marketing provide a product, product family, or process family forecast for the following 12 months. Product engineering projections for new product introductions are combined with current product projections. This projected Customer TAKT (rate of demand) is compared to the forecast provided by operations of their capacity or Operations TAKT (rate of supply). Customer demand is agreed upon, and operations capacity adjustments are planned accordingly. Involvement by top executives as well as process stream or process area management validates enterprise commitment to the enterprise plan. In the near term, immediate adjustments are driven through the follow-on processes of MPS and MRP to adjust buffers and kanbans. The capital budgeting process depends on the S&OP figures for equipment and facilities utilization projections. Resource planning for employment and hiring is conducted from the central plan as well.

Financially, the budgeting process is updated monthly, and the annual budgeting process is eliminated in favor of this "continuously updating" budget.

Among the most critical issues cited by proponents of lean is the need for active management involvement. The Lean Performance methodology presented in this book initiates from management policy deployment. Without this, there is no project and no lean transformation. Implement your new (or old but not working lean) ERP system utilizing another methodology than Lean Performance if management is not able to perform policy deployment. The regular management policy deployment activities are utilized by accounting to drive process improvement to the enterprise.

The most important element of management involvement in the continuing lean transformation and lean enterprise is to be loyal to the people in the enterprise. The Lean Performance cultural principle is "Loyalty to people enables continuous improvement." Be loyal, or be a mass producer. There are two elements of cultural loyalty that can be facilitated by the accounting function in a lean enterprise. Tracking the number and profit impact of each process improvement is the first. Often, process owners and operators express an improvement in terms of a process measurement such as units, feet, or cycles. Accounting can assist in each case by developing a meaningful "translation" from process measurements to financial measurements. The second critical involvement is in the development of profit- or gain-sharing programs. Sharing the gain is the surest way to keep the gains coming.

Lean accounting is concerned with the accurate measurement and reporting of the costs and opportunities evident in a lean transformation. Understanding the changes, risks, and opportunities to the enterprise inherent in those changes is the province of the lean accountant. Measuring operational improvements and their profit impact is an important contribution that can be accomplished in the new lean accounting processes and practices.

A fundamental paradigm shift is necessary for the formerly mass managers to shift from short-term cost prevention to long-term asset utilization and business growth. Key to the analysis of costs and opportunities of lean transformation is the utilization of freed-up capacity. There are process owners and operators who formerly worked in mass processes who are available for more value-creating work. As lean transformation eliminates MUDA, and less of the available capacity of the enterprise is utilized to produce the same or more value-added output, the cost of not acting to proactively leverage these newly available resources to contribute to cash flow and profit is a hidden risk of transformation. As we enjoy better information about the real costs of process and product, in the now lean enterprise we have more capacity, both in facility and people, to put to productive use.

Capital planning in the lean enterprise is not a return on investment analysis, but rather is driven by the 3P process. Considering the available people, capacity, and other enterprise resources, a 3P process develops multiple possible strategies to utilize the resources and grow the profit stream. Perhaps a new flow facility can be designed within the existing walls that allows for a better QCD on a product or products. Strategies can encompass manual, low-tech approaches or fully automated high-tech approaches for new products and services. The accounting function is critical to this activity.

Lean accounting is one of the rapidly solidifying process areas of the lean enterprise. Far from being an impediment to lean transformation, proactive lean thinkers in accounting are becoming a recognized asset to lean transformation and the continuing transformation to the Virtual Lean Enterprise.

Chapter 3

Lean Performance Methodology

What Is the Virtual Lean Enterprise?

The Virtual Lean Enterprise is an enterprise where a holistic application of *kaizen*, lean, Six Sigma, and various IT enablers have been implemented in all lean processes, including cross-functional and cross-enterprise processes. This enables the enterprise to link with other Lean Commerce practitioners to utilize lean practices to collaborate in processes including new product development, material planning and order fulfillment, supplier management, and sales force automation. A Virtual Lean Enterprise is enabled by a myriad of technologies, including:

- ERP (Enterprise Requirements Planning)
- CRM (Customer Relationship Management)
- SCM (Supply-Chain Management)
- SRM (Supplier Relationship Management)
- PLM (Product Life Cycle Management)
- CAD/CAM Interchange
- Quality Documentation Interchange

A Virtual Lean Enterprise recognizes that 70 percent or more of an organization's product cost, design, lead-time, supply-chain planning, and manufacturing is outside of its own facilities. A Virtual Lean Enterprise has discarded the old paradigm of commerce in the mass industrial era ("Give the customer any color that he wants, as long as it's black") and has incorporated the Virtual Lean Enterprise paradigm ("Give the customer any color, size, shape, etc., *s*he wants, where *s*he wants it, when *s*he wants it. And do it without holding inventory of any type").

Finally, a Virtual Lean Enterprise is the virtual space in which data about supply and demand push and pull is exchanged and acted on by virtual partners who understand and are committed to Virtual Lean Enterprise principles:

- All data about demand and supply is shared between partners engaged in Lean Commerce in the Virtual Lean Enterprise space.
- All partners act on demand and supply data to support partners' requirements as each partner sees fit and is lean enough to execute while fulfilling 100 percent of every partner requirement of demand and supply—right part, right quantity, right date.
- There are no perfect forecasts in the Virtual Lean Enterprise—there are buffer inventories and there is expediting.
- Partners are certified to join the virtual enterprise space when a current partner who is affected by supply certifies that the new partner can meet their demand. All other partners are free to place requirements with the new partner, or not, as they each see fit.
- Supply-chain agreements are executed among the partners to ensure that data within the virtual space is not shared with entities outside the virtual space and agreements.

Where can lean thinking be used? It is the premise of this book that it can be used on any job, in any process, in any manufacturer or service sector firm, and in any economy, *regardless* of the size of a firm, level of technology, operator skill, or professional staff employed.

In Lean Production, the system is the complete set of processes required to produce a product. When lean principles, tools, and practices are applied to all processes in a company, you have a lean company. In 1996, two of the authors of the original MIT study published a new study in which they describe the phenomenon of applying Lean Production principles to all processes in a company, and to all processes in the chain of companies involved in producing a product in the lean enterprise (Womack, James P., and Jones, Daniel T., *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*, Free Press, New York, 2003).

The concept of a lean enterprise extends the process definition to include all processes required to produce the product in all the companies that play a role in producing materials, components, supplies, etc., for that product. We are reminded that *The Machine That Changed the World* is "Toyota's interconnected ideas about Product Development, Production, Supply Chain Management, and Customer Relations *systems*" (emphasis in original, Womack and Jones, *Lean Thinking*, 239).

When lean companies are linked in a business activity producing product together, they have a lean enterprise. When lean companies are linked in business activity producing product together, and are enabled by the Internet and other information technologies, they have a Virtual Lean Enterprise. I will discuss the processes for the emerging phenomenon of lean enterprises linked in business relationships of this design in Chapter 4 titled "Lean Cross-Enterprise Processes." The project methodology that is Lean Performance is designed to assist this Virtual Lean Enterprise to emerge, enabled by the proliferation of information technologies that are stabilizing in the e-commerce marketplace now.

The computer is a processor of data, and it supports other system processes (in the lean enterprise sense, not just the information sense) by providing information to them. These "system processes" include the management decision and information/support processes, the cross-functional and cross-enterprise processes, and the physical processes. Notice the minimized role assigned to the computer. The computer is not the process, and the processes are not in the computer. At best, the computer is a *c*entral *p*rocessing *u*nit of data that supports and enables lean processes across the virtual enterprise. If you are operating under the illusion that the process is in the computer, look around your office or work space. If the process is in the computer, why is all that paper out here with us? First and foremost in achieving the Virtual Lean Enterprise must be the recognition that the technology is only the enabler of lean processes. It follows that the IT engineer is also an enabler or facilitator of lean information–based processes.

The lean enterprise has a number of recognizable characteristics. It is a linkage of companies that are process managed or product team managed, not department or hierarchically managed. The companies in the lean enterprise utilize teams and empowerment. All three types of processes are identified and continuously improved in the companies composing the lean enterprise. All processes, including cross-functional and cross-enterprise processes, are subject to lean principles, tools, and practices. Continuous improvement activities identify and eliminate waste in all processes throughout the lean enterprise chain, cooperatively, continuously, and relentlessly.

Lean and ERP: Why Can't We All Just Get Along?

Lean and ERP are consistently rated in manufacturing improvement surveys as the two most important strategies being utilized by manufacturers attempting to compete for sales and profits in the global markets. Although this fact would seem to be an endorsement of both strategies, when utilized together lean and ERP are often in conflict.

Many lean thinkers believe that the "push" ERP/MRP system processes doesn't support the "pull" of lean physical process flow. ERP advocates often agree but counter that there is no alternative to a "push" of data from the customer facing processes to plan buffer inventories and supplier requirements. Early in my production and inventory management career, I became enamored of the idea that one could obtain a 100 percent buildable, accurate, and adequate production schedule from MRP. A colleague once (correctly) accused me of spending 15 years trying (and failing) to develop a computer-based "100 percent buildable schedule." It seems that when the mechanics of producing the production schedule meet the realities of customer order changes; vendor, machine, quality and worker vagaries; and failures of the real production workplace, using a computer to schedule what to build (100 percent buildable), and then attempting to actually build that schedule, is an exercise in futility.

Software developments intended to produce this result have included various "workbench," "line loading," and "APS" system additions. Most have failed to do the job, with inserts, substitutions, and system schedule/data changes and inaccuracies dominating.

From an inventory control perspective, many environments implementing lean currently use shop orders to authorize material consumption and as a data collection control device, and wonder if they should continue. Other processes generated or supported by MRP/ERP such as order promise and delivery and dispatching also seem to be in conflict with lean.

We have been collectively attempting to surpass the Lean Production architecture of the Japanese lean producers, including Denso, first described in the West by Richard Schonberger in *World Class Manufacturing* (Free Press, New York, 1986). Schonberger described using MRP data to plan, with pull mechanisms in the physical processes to execute. In the 1980s and 1990s and even today, Japanese "lean producers" utilized those lean practices, with great success. My initial exposure to "Japanese" lean MRP was in a transplant and joint venture with Japanese producers utilizing the MRP/plan–work order–kanban architecture. It is simpler than the work order dispatch architecture of contemporary ERP-based MRP. It utilizes a blanket shop order/backflush construct to rationalize reporting. Of course, back in the late 1980s it drove the accountants crazy.

The latest counterproposal from the lean camp to utilizing ERP/MRP, even in the "lean ERP" approach, is lean consumption, which is based in the idea that we can and should develop customers who order what we are ready to produce and deliver, in the quantity and at the time we are able to "pull" through to delivery. This is a noble idea, and one that should be implemented as far as possible with one's customers, but it seems unrealistic to expect all of our customers to order what we are poised to produce. Even if the customer always placed an order within product lead-time, there would still be a need to utilize business or Sales and Operations Planning and MPS in order to have facilities and employees ready to process materials for shipment.

In many environments today, reworking the schedule is a continuous activity. In an increasingly competitive world, where our customers want what they want when they want it, we strive to give it to them—even if what they want today isn't what they told us they wanted yesterday. The Lean versus ERP question can be posed in two ways:

1. Does our lean enterprise really need ERP? If you are familiar with the title of this book, you already know that this is a trick question. It is clear that this book promotes the fact that Lean ERP enables the Virtual Lean Enterprise. Let's ask the question from the other point of view:
2. Are ERP (and MRPII) the enemy of Lean Production?

A little background is in order. It is the position of this book that most of the controversy between lean and ERP is the lack of common understanding of what each has to offer the other, and where one or the other should be preeminent.

ERP is a broad-based, integrated application system that collects data and disseminates information throughout the organization for the purpose of aiding decision making. ERP systems generally incorporate some form of MRP, but many today also include lean alternatives to shop order scheduling and production/inventory control, such as support for flow manufacturing, drum-buffer-rope, and pull or kanban tools.

MRP is the planning function within ERP. MRP employs a repetitive four-step process to "push" demand:

1. Determines gross requirement from the MPS and BOMs
2. Nets gross requirements against available stock/orders
3. Determines lot sizes from order policy rules
4. Back-schedules to determine when to start manufacturing

This activity repeats at each level of each BOM until all requirements are planned.

An MRP plan is a "push" because it is based on a forecast, at least in part. To lean thinkers, "push" scheduling is a source of overproduction. Lean thinkers link "fixed" lot sizing to excess handling, transportation, and inventory. Lean thinkers decry the transactional support required for MRP as nonvalue-adding activity.

Traditional manufacturing resource planning (MRP II, the planning engine in most ERP systems today) does base production levels in part on sales forecasts. In contrast, lean manufacturing ties production levels to actual customer demand. Lean emphasizes getting the manufacturing process right and then continually improving it; with ERP the emphasis is on planning. Lean has the goal of eliminating all wasted time, movement, and materials; ERP seeks to track every activity and piece of material on the plant floor. Lean is action-oriented; ERP is data-dependent. Lean focuses workers on doing only things that add value to the product; ERP has everybody recording data and bar-coding everything in order to keep track of inventory and labor. Even with all that keying and scanning, everybody is skeptical about the reliability of the data.

There are two sides to every issue. Some say lean and ERP can coexist in the same plant; others disagree, viewing them as oil and water. Statements such as

"Forecast-based systems are a waste of time and are usually wrong" and "We want to eliminate MRP because it doesn't work" are often heard.

Let's face it—ERP often *is* a liability, introducing or perpetuating problems present from the days of basic MRP, including complex bills of material, inefficient workflows, and unnecessary data collection. The introduction of lean to a plant suffering from MRP-induced ailments often offers a much-needed reprieve as flow replaces transactions.

What went wrong? Some manufacturers spent millions of dollars putting in companywide ERP systems without first leaning their manufacturing processes (or any processes). Or, while manufacturing was getting lean, IT heeded the siren song of ERP from other company power centers. Like finance, order management, materials, etc., ERP has vastly improved many processes.

Some companies that have fully embraced lean manufacturing have attempted to simply disconnect the MRP functionality of ERP altogether because it creates a lot of nonvalue-added transactions. The sentiment is that in a complete demand-flow operation, if you have your process correct, there's nothing to track: it's moving too fast. Lean practitioners also complain that most ERP software companies have all but turned their backs on the lean concept. ERP software vendors generally have been slow to connect their systems with those inside the plant. Standard flow-manufacturing practices are just now driving "standard" software products for flow. Some companies use "flow" software, either packaged or homegrown, to run manufacturing, and the rest of the business is run with an ERP system.

Although the ERP software community may be guilty of underreacting, the development of effective software for a process follows the development of that process. It could hardly be the case that the software would be here before we adopted lean in the factory and needed the software. Software development is also iterative. Trial and error is the rule. Lean is recent. Nearly half of the 500 largest industrial firms deploy continuous-flow production strategies, reports Industry Directions Inc. Lean is here.

An effective flow manufacturing module is one that considers the differences between push and pull transactions. Flow software supports kanbans so that triggers for a kanban go from the line to suppliers automatically. This requires integration with the supplier management functions of ERP, or an SCM (supply-chain management) approach. It is especially important to make the necessary points of connection between the two. This includes inventory data, demand information (customer orders or forecasts), supplier information on material availability and procurement, cost data, and the item master.

Although some lean manufacturers have done away with MRP, even they still need some mechanism for long-term planning. Without an ERP/MRP process, they depend on forecasts that their customers fax or e-mail weekly or monthly to project capacity. The overriding fact is that they only produce something if there's a demand for it. Shorter lead-times for their products are what really keep them in business, as well as lean or flexible suppliers.

There are a number of other issues driving the need to fully integrate and manage the entire stream of processes that generate and consume demand and supply data.

The "informal system" still runs operations in many production environments. Spreadsheets and other "ad hoc" software development have replaced or supplemented central ERP systems. In some environments, ERP hasn't been implemented at all. In others, Sales and Operations Planning (S&OP) is not performed well (or at all) and the resultant MPS/MRP runs "push" raw customer demand into the factory schedule. No wonder lean proponents in these poorly planned facilities think MRP doesn't work. That style of MRP didn't work in mass production environments, before lean arrived as a management system. Don't blame MRP—blame management for not performing S&OP.

A "push" of data from the customer facing processes is integral to satisfactory order delivery unless the customer always places the order within our cumulative lead-time requirements. This doesn't seem likely.

The lean camp does not always agree. Many lean thinkers are investigating various issues associated with the effective use of manufacturing systems in facilities attempting Lean Production implementation. Some have made or are contemplating making changes to their MRP/ERP systems. Others have replaced or are supplementing the use of central systems with spreadsheets or "ad hoc" software development.

The performance of "production smoothing" (*heijunka)* routines on decentralized PCs is becoming increasingly prevalent, as this lean practice is more widely adopted and essential in Lean Production environments. Lean also means "central common data"—data from a consistent, accurate source that is available to all in the enterprise who need it—and the "central common data" source is the ERP machine. Developing "islands" of data violates one of the earliest practices endorsed by the practitioners of lean. It is separate data—as Ishakawa said, "Doubt it." In production smoothing, TAKT time calculations are being performed by a variety of methods—and the issue remains as to whether any of these methods is sound. Some lean proponents say that all they need to arrive at solid TAKT numbers is good forecast/demand/customer order/shipment/inventory data. And, that's MRP. ERP proponents are beginning to investigate whether well-managed SOP/MPS processes can develop an "automated" TAKT for use in production smoothing. I will discuss this in "Lean Commerce," below.

The "spreadsheet builders" and "PC architects" often go down in flames when attempting to keep ever more voluminous and multisourced data streams in workable condition. Today, many "leanies" are marching down the road of "separate data," building what may one day be a big computer with new production smoothing software, but at what expense?

In many lean environments, shop orders are being ignored or abandoned as a production control practice. The need to authorize production "upstream" is accomplished by visual signals, or kanban practices and tools.

The tracking of material consumption is becoming more difficult, as ERP system "push" inventory issue/receipt practices are replaced by "visual pull" practices, and material consumption transactions are not recorded. Forward flushing replaces back flushing—and the inventory records and BOMs are still inaccurate.

ERP order promise and delivery based on schedule management is "disconnected" from the pull-based flow and increasingly not useful. FAX-based supplier management is at an all-time high, while ERP-based supplier broadcast capability is underutilized. This commonly included ERP system feature, useful to advise vendors of current and proposed schedules, often includes a "pull" signal feature for current requirements. It is based on MRP data.

Even as Radio Frequency Identification RFID, is implemented to provide the ability for the inventory in WIP or in transit to tell us where parts are, central data collection and dissemination is on the decline. Next, the parts will tell us when they will arrive. Without ERP/MRP, what will we post that data to?

Visual signals are utilized in production physical processes to support "pull," but it is tough to pull visually across any distance—like to China, or even Milwaukee.

Experience in lean flow production demonstrates that customer demand fluctuations cannot be allowed to enter the manufacturing flow, especially to spread to the supply chain. Instead, success is obtained when manufacturing determines a time fence within which production is "smoothed" or "leveled." The time fence initially should be synchronized with short horizon customer demand, illustrated in the Lean Commerce Model, below. Additional time fences should be utilized at other time intervals.

Many from each camp are asking about the impact of managing component lead-time and whether MRP or "something else" can assist. Many in the lean camp are wondering how to manage buffer inventory calculations and how to connect those calculations to "current TAKT." Buffer stocks are also difficult to size and resize when customer lead-time is less than total product lead-time, especially where demand is seasonal or fluctuating. Identifying and addressing these and other system issues is critical to lean implementation success. The place to start is with Lean ERP, and the software that needs to be developed for lean flow can and will emerge as experienced software developers are more and more thoroughly brought into the lean world.

ERP is the data collector, processor, and disseminator enabling supply-chain logistics, collaborations, and key processes. The best way to determine if your lean enterprise will need an ERP system is to examine the processes that are performed in your enterprise to see if they include any of these key processes that need ERP:

- Buy/pay process. This provides the ability to create purchase orders, receive material, record lot numbers, hold product, and pay suppliers while charging specific cost centers.
- Order/ship process. This enables pull support for shipment trigger, shipping, inventory updates, and accounts receivable.

- Financial/reporting process. This enables balance sheet and income statement reconciliation and product-focused cost roll up.
- Forecast, sales, and operations planning, master scheduling, material requirements planning, capacity planning, and vendor plans and pulls. All support and enable the "forward" view of capacity and material plans.

If you need to support these processes, at a minimum, you can benefit from an ERP system. Do not, however, implement that ERP/MRP system from a "mass production" perspective.

A Lean Performance ERP implementation has fewer transactions and fewer exceptions. There is no transaction support for exceptions, just like a lean factory has no returned goods storage rooms for product returns. We do not issue an MRP schedule, but we do use the MRP plan to advise our work centers and vendors what will "probably" be pulled in the next planning and production periods. This allows for capacity planning as well as evaluation of buffer and seasonal requirements. As we reduce batch sizes, balance operations, implement pull systems, and supplier kanbans we can eliminate all the MRP-based shop floor control. We also eliminate kitting, WIP reporting, shop order creation, order firming, reconciliation, spot purchase orders, and MRP regeneration while converting to bin and pull system kanban. No transactions are needed. In a lean operation, the only transactions of value to the shop floor are raw material issue (backflush) to allow for cost center and product roll up and finished good creation to allow inventory updates to support order processing and shipping.

In terms of the underlying ERP software, we always scrutinize proposed upgrades and decide applicability based on fit to Process Standards (we need them for *all* processes, including management decision and information/support) and use only those features needed to support lean processes. Last but not least, it's not OK to fix (or improve) my process by breaking your process. No additional work (waste) for anyone without QCD measurements first.

MRP is the best approach for detailed production lead-time/component lead-time and buffer stock management. Because a 100 percent buildable schedule cannot be obtained from a computer, pull is a better production control system. ERP is the best approach for supply-chain and logistics data and information collaboration.

Enterprise decision makers have to consider the cost and benefit of the three paths of Lean ERP development and deployment available today. One can choose an existing ERP vendor that supports a lean philosophy and provides lean support, or an emerging lean vendor, or a homemade solution. One opinion is that before we "reinvent" (at great expense) 50 plus years of MRP/ERP-based systems in order to develop new "lean software" systems, we should examine approaches that link systems that already work in the push planning processes to the lean pull and flow that works better in production processes.

The Failure of ERP Implementations

In one of the more expensive examples of a failed ERP implementation, Dell Computer stopped an ERP project after spending more than two years and $200 million attempting to implement. Dell executives were said to be unhappy with the "off-the-shelf" vendor-supplied software, and intended to start over, utilizing a "best of breed" hybrid approach. The failed implementation was discussed in Harvard Business School's summer executive education program for three years, from 1998 to 2000. This particular program attracted senior IT and general managers from more than 80 companies worldwide ("Surviving Enterprise Systems: Adaptive Strategies for Managing Your Largest IT Investments," Austin 2001).

Why is Lean ERP so important? An otherwise lean company cannot thrive without a lean ERP system. Let's take a look at one of the seeming lean juggernauts in physical and supply-chain processes: the aforementioned Dell Computer.

Did the ERP implementation failure at Dell contribute to the subsequent well-documented service problems experienced by Dell customers? Reading an interview of incoming Dell chief executive Kevin B. Rollins published by the *New York Times* on August 15, 2004, one would not get that impression. When the interview took place, Dell had just lost its position as No. 1 in providing corporate customer service, as ranked by Technology Business Research. The *NYT* quoted Mr. Rollins as referring to the change in rank as due to a "transitory slip in customer service," a comment that seems to imply that Dell would quickly regain the ranking. In fact, Mr. Rollins stated that "if you look at their (Technology Business Research) latest, we're back up to No. 1 again." Rollins went on to state that the accusation that the offshoring of service support to India was the problem was incorrect, commenting "India wasn't the problem. India was only indicative of kind of a slip we had across the board, and we had to go back and reshore and regroup and improve."

What results have been noticed since? Although the Technology Business Research survey results were from Dell corporate customers, presumably Dell's most valued customers, a more recent look at the general customer service issues at Dell reveal ongoing, and some might say accelerating, service problems. An article published in the *New York Times* on February 23, 2006, titled "How to Survive a Dell Tech Support Call" reads like a Jon Stewart comedy routine as it skewers Dell for continuing and worsening service problems. Contributing reader John Stumpf concluded his "rant" with the following: "All of the events related here are based on my experience with two incidents. The process was so frustrating that I probably will not buy another Dell." This doesn't indicate much positive progress. It gets worse. In a follow-up column on March 2, 2006, the *New York Times* reported, "Saying that his [Mr. Stumpf] essay hit a nerve with readers would be the understatement of the century. Here's a sampling:

- This is exactly the experience I had. Very frustrating...
- The Dell Support story is right on. Which is why I will NEVER buy another Dell computer.
- This column would have been humorous if I hadn't gone through this experience twice...
- Sometimes they wait while you do the reinstallation—45 minutes or so. And if that doesn't work? They apply the GIVE UP Solution!
- I actually live in fear of calling Dell's technical support, and hold back sometimes from doing things with my computer at home, because of it."

The article continues, quoting a response by a Dell VP contained in an e-mail to the *NYT*: "We shipped more than 10 million computer systems last quarter and have seen a 30-percent decline over the past year in the rate of service contacts per system sold." However, saying that because fewer people are complaining means customer service is better may not be an accurate insight into customer behavior. Once customers have given up on service, they may have just stopped calling. They also may have just stopped buying product. Recent sales figures for Dell may be a better reference point of the continuing impact of poor service. Hewlett-Packard surpassed Dell in the third quarter of 2006 as the leading PC seller in the world, according to iSuppli Corporation. In fact, in an expanding PC market, Dell reported a decline of 1.9 percent in units shipped during the third quarter of 2006 compared to the third quarter of 2005, while Hewlett-Packard reported an increase of 16.7 percent in units shipped over the same period (iSuppli Corp., November 2006, "iSuppli Table: Preliminary Ranking of the World's Top-Five PC Makers in the Third Quarter of 2006"). Dell has since announced that the former CEO of American Airlines will assume the position of CFO at Dell. Carty, according to CEO Kevin Rollins, is an ideal choice to lead "Dell 2.0," a turnaround plan announced a few months ago to boost sales and improve customer service in the face of stiff competition from Hewlett-Packard and others (Associated Press, December 20, 2006).

Implicit in this announcement is that the service problems at Dell are not solved, and that perhaps CEO Rollins has linked the service problems to the lagging sales performance. To be sure, not all of the service problems recounted here can be traced back to a failed implementation of ERP. A problem such as not being able to boot up the operating system of your new Dell PC may originate in an internal machine error. But what if that internal machine error was caused by an outdated specification being utilized by manufacturing, while engineering already implemented an engineering change that makes the former versions incompatible and manufacturing didn't get the notice because it ran off of its own "disconnected" PC data and software to load the machines in production? Certainly, problems in order confirmation, shipping addresses, lost shipments, missing components, incorrect billing, incorrect pricing or terms, incorrect lease information, incorrect credit processing, and other customer service problems can be traced back to poor or no

ERP systems support. Although Dell is a seeming paragon of Lean Production, operating with central data in accurate customer support processes does not appear to be in place. Could a Lean ERP system have helped? (As this book goes to press, CEO Kevin Rollins has been replaced by founder Michael Dell, who is returning to his former CEO role. Dell has restated earnings for several years, and the Securities and Exchange Commission is determining the scope of a proposed investigation concerning accounting processes.)

Lean and Six Sigma

Lean Six Sigma and lean manufacturing are toolkits to reduce waste in business processes; each is a proven concept that has saved practitioners millions of dollars. Lean manufacturing is a proven approach to reduce waste and streamline operations. Lean manufacturing embraces a philosophy of continually increasing the proportion of value-added activity of business through ongoing waste elimination. A lean manufacturing approach provides companies with tools to survive in a global market that demands higher quality, faster delivery, and lower prices. Lean manufacturing dramatically reduces the waste chain, reduces inventory and floor space requirements, and it also creates more robust production systems and develops appropriate material delivery systems while improving layouts for increased flexibility.

Six Sigma is a business quality philosophy of doing business with a focus on eliminating defects through fundamental process knowledge. Six Sigma methods integrate principles of business, statistics, and engineering to achieve tangible results. Six Sigma tools are used to improve a company's processes and products. These tools are applicable across every process, including processes in operations, sales, marketing, design, and all administrative and service processes.

When skillfully applied, Six Sigma reduces costs through a self-funded approach to improvement and it reduces the waste chain. Six Sigma can also provide a better understanding of customer requirements and can improve delivery and quality. Six Sigma can also provide critical process inputs needed to respond to changing customer requirements and assist in the development of products and processes while driving process improvements rapidly. Six Sigma practices and tools include:

- DMAIC—Design/measure, analyze, improve, control
- Yellow, green, black, and master belts
- Variation reduction
- Project focus (one to three months)
- Statistical process control (Cp, Cpk)
- Measurement system assessment (Gage R&R)
- Root cause analysis and hypothesis tests
- Design of experiments, Taguchi methods

- Regression analysis
- Analysis of variance (ANOVA)
- FMEA (failure modes and effects analysis)
- Evolutionary operation (EVOP)
- Response surface methodology (RSM)
- Process stability

A successful Six Sigma project requires management direction and effective project selection. Highly trained black belts shouldn't spend months on projects that won't have a bottom-line impact. Unfortunately, the solutions to many complex and long-standing problems can't be resolved using intuitive methods in a week or less. One critical difference between lean and Six Sigma is that most lean programs develop Process Standards; *kaizen* and value stream mapping activities depend on teamwork to develop process improvements, while at times an elite culture can develop around "black belts," with isolated number-oriented projects that often disappear into the engineering office rather than sustain visibility and involvement with process operators. Companies using both methodologies generally begin by applying basic lean-manufacturing techniques: 5 Ss, standardized work, and the elimination of waste. Six Sigma is appropriately seen as a tool to assist in more complex diagnosis of process problems and irregularities. Once lean tools and practices eliminate much of the noise from a process, Six Sigma offers analytical and statistical tools that uncover potential causes and viable solutions to chronic process problems. Bringing the two concepts together delivers faster results by establishing baseline performance levels and focusing the use of statistical tools where they will have the most impact. In this approach, lean is the baseline enabler for Six Sigma success. Lean Performance projects deliver Process Standards for further Six Sigma analysis and improvement. The process workflow standards that teams complete in the Lean Performance approach are Taylor-style input–task–output, which flow readily to the Six Sigma–style DMAIC templates.

Why Should Our Enterprise Be Lean?

Why get lean? There are four important reasons:

1. To survive among lean competitors
2. To gain a strategic advantage
3. To meet customer expectations
4. To respond quickly to opportunities and threats

In the first years of the new millennium, quite a bit has happened in the rollout of the lean global supply chain—well, at least for Toyota. Toyota has enjoyed a substantial increase of both market share and profits in the worldwide automobile market, such as those reported in the 2003 fiscal year. In that year, Toyota reported profits of about $10 billion on about $125 billion in sales. Toyota was then the second most profitable car company in the world, with a return on sales of nearly 8 percent.

In 2003, Toyota established a goal to capture a 15 percent share in the global automobile market by 2010. If that were accomplished, it would establish Toyota as the global market share leader, past GM and Ford. If one had looked back to previous Toyota volume predictions, one could have noted that in 1995 Toyota established a goal to capture a 10 percent share in the global automobile market by 2000. In 2000 Toyota's share was 10.01 percent.

In 2004, at least one automotive market analyst had Toyota ahead of DaimlerChrysler in U.S. sales and in the Big 3 by 2009, with Toyota's U.S. sales growing nearly 25 percent to 2.5 million vehicles. Automotive market analyst CSM Worldwide stated that in 2004 Toyota, including its Lexus and Scion brands, held 12.2 percent of the U.S. market. CSM predicted that Toyota's share would grow to 14.1 percent by 2009, enough to knock DaimlerChrysler out of the Big 3. CSM also predicted that GM's U.S. share would decline to 25 percent in 2009 from 27.5 percent in 2004 and Ford would drop half a point to 19.2 percent. CSM stated two reasons for its dire predictions. The first was that Toyota had more money to invest: Toyota Motor Corporation earned $10 billion in 2003, more than General Motors, Ford, and DaimlerChrysler combined. The second was that Toyota was introducing many new models, including hybrids in luxury full-size and compact versions (as reported in the *Chicago Tribune*, December 29, 2004).

What happened? In 2004, the auto industry enjoyed its fifth best sales year overall, selling 16.9 million units. However, the domestic Big 3's share of the U.S. market slid to an all-time low of 58.7 percent. The Japanese J-3 of Toyota, Honda, and Nissan increased its combined share to 26.3 percent of overall calendar-year sales of 16.9 million. Domestic brands had accounted for 68.5 percent of the market in 1999, and as much as 73 percent in 1994, when Toyota, Honda, and Nissan held 17.6 percent (as reported in the *Chicago Tribune*, January 5, 2005).

From 1999 through 2004, the number of total vehicles that the Big 3 produced in North America dropped 18 percent, or 2.4 million vehicles, to 11.07 million units. During that same period, vehicles made in North America by the J-3 jumped more than 1 million units, or a whopping 41 percent, to 3.64 million units (as reported in the *Chicago Tribune*, January 26, 2005).

It isn't as though Toyota is fiddling while Detroit burns, either. Toyota has established a global build of 9.42 million vehicles for 2007, a 4 percent increase over the 9.04 million vehicles produced in 2006. This figure will surpass the estimated 9.2 million vehicles produced by GM in 2006. Toyota is using some of its industry-best profits to build and purchase production capacity, including stakes in Fuji Heavy Industries and Isuzu. Toyota began making Camrys alongside Subarus at Fuji's plant in Lafayette, Indiana, beginning in early 2007 (Associated Press, December 22, 2006).

What accounts for the shift of volume going to the J-3? We know that one of the primary beneficial effects of lean transformation is to uncover "hidden" capacity in a plant. A lean plant can produce more product with the same resources than a "traditional" plant, and a lean plant has a higher gross margin (net revenue less cost of goods sold, as a percentage of net revenue). But what about the overall effect of the Toyota Production System? How much better is TPS? Driving the prodigious investments in new production capacity for the J-3 is a significant advantage in productivity. One study in 2001 demonstrates the basis for the increasing capital investment available to Toyota by investigating labor productivity, measured in dollars of sales per employee, for the 2000 fiscal year. GM reported $446,000 per employee, Ford reported $446,030, and Chrysler reported $337,850. Toyota reported a startling $721,700 in dollars of sales per employee (United Nations Conference on Trade and Development [UNCTAD], World Investment Report, 2001, Geneva, Switzerland).

As late as 2006, it was still an emerging opinion that the reason that GM and Ford had not made the "lean" adjustments to their respective management systems was because they were captive to the capital markets to raise continuing operating funds, and the capital markets only understand mass production practices when it comes to remaking the enterprise. Wall Street understands plant closings, squeezed suppliers, and employee layoffs. Meanwhile, Toyota, Honda, and Nissan were able to focus on process improvement and customer satisfaction. Ford and GM are still plagued with "overcapacity, complex and inflexible production practices...Costly union strikes, negotiations and contracts...[and] Because the Big 3 dictate methods to their suppliers, damaging practices permeated the auto supplier industry" (*Industry Week*, January 24, 2006).

The same study went on to say that "many of the…auto-industry companies with financial problems also have individual examples of outstanding process improvement, impressive levels of quality, and innovative and popular products. But unlike Toyota,…these examples are sporadic and at the plant level." It seems that the operations leaders at the Big 3 had been able to "get lean," but their executive management and financial management counterparts had not. In 2006, most mass production companies were just beginning lean initiatives in management decision and information/support processes, let alone in company cultural principles or practices. Executives still thought about lean as a plant-level cost-cutting tool. The capital markets could not see the connection between lean practices and superior financial performance, because lean doesn't magically appear in the quarterly balance sheet the first quarter after the *kaizen* events begin. Companies who have devalued the Toyota Production System by using it sporadically to boost output without recognizing and adopting the lean cultural principles have missed the long-term benefits that are accruing to the lean J-3 producers. Although it may be past prime time for the Big 3, it is never too late to correct a mistake (Message to Management, Allfrey).

Early returns on Big 3 attitudes and achievements in bringing lean practices to the office are not all positive. In one instance, a report from GM may not inspire much faith in its lean product development future. A major criticism of the Big 3 is that it takes too long for them to "refresh" their product offerings. Time to bring a new car from concept to dealer lot is a critical component of customer satisfaction. Models do not have as long a product life cycle as in the past—even the recent past. Having good concepts for new models is one thing. The processes to bring those concepts to the dealer showroom rapidly and with a competitive cost of production are equally or more important. GM Chairman and CEO Rick Wagoner hired Robert Lutz to tap his instincts for what people want to buy, a design-driven philosophy honed over 40 years at various car companies. Before Lutz joined GM five years ago, product planners and brand managers dictated a car's dimensions and proportions. Lutz has turned that world upside down. "We have to ensure that new ideas come from design and let the other people figure out how to make it work," he said (*Chicago Tribune*, October 1, 2006).

"Over the wall" design engineering isn't new. It is a long-standing mass production practice. Here are just some of the missed design opportunities cited in a recent study that illustrate just how off-target (target cost) the Big 3 product introduction teams are. Common platforms, body architectures, and components such as air-conditioning and heating systems enable Toyota to save about $1,000 per vehicle. Fewer unique parts means improved quality, reducing warranty costs, and enabling savings in purchasing, transportation, product design, inventory costs, and plant equipment. One of the Big 3 introduced a new model with 81 total side-view mirrors, based on configuration. Another of the Big 3's products has 41 different seat frames, compared with five for the most efficient carmaker. Yet another Big 3 product has over 100 different catalytic converters in its exhaust systems. The most efficient company (Toyota) has five (Harbour/Felax Study, reported in the *Chicago Tribune*, October 6, 2006).

The *Wall Street Journal* reported on December 2, 2006, that the Big 3 had more than 2.2 million unsold cars in inventory between them. That figure is roughly equal to the total vehicles sold in the first quarter of 2006. Although Big 3 inventories have historically fluctuated between 90 and 120 days, cost pressure at the local dealer sale level is causing Big 3 auto dealers to increasingly resist the "push" of cars from the factory, declining the costly honor of storing excess on their lots and instead asking the Big 3 to take steps to reduce stocks to no more than a 60-day supply.

One of the Big 3 is stepping up the challenge. As 2006 ended, DaimlerChrysler announced reductions in vehicle production that would bring inventories in line with demand by early 2007. Chief Executive Officer Tom LaSorda announced that inventory would be near 500,000 vehicles in January 2007, down nearly 100,000 from the summer model year changeover peak. In spite of these cuts, DaimlerChrysler is the only one of the Big 3 that CSM Worldwide expects will increase sales and market share in 2007. CSM believes DaimlerChrysler will increase sales by over

50,000 units, to an overall 2.39 million. In large part, CSM attributes the growth in sales to the fact that the company will bring out nine new models in 2007 (*Chicago Tribune*, December 15, 2006).

In a separate report, published the same day, the head of product development for DaimlerChrysler addressed one of the root causes of sluggish sales by announcing that the company would cut product development time by as much as 50 percent—to as little as 12 to 14 months—from concept to showroom. The primary goal is to adjust more quickly to changes in customer tastes.

A component of the faster-to-market product development strategy is to use "common" motors, chassis, and parts. As this lean development strategy is realized, all associated costs of developing, maintaining, and inventorying said "common" components declines substantially, in comparison to the formerly bloated SKU base required to support model proliferation. Unfortunately, the analysts still don't get it. An analyst from WestLB is quoted as stating, "This probably won't have a significant improvement on the bottom line." Tell that to Toyota (*Chicago Tribune*, December 15, 2006).

The moral to the story is that you can't solve a problem caused by mass business administration practices by applying *more* mass business administration practices (Messrs. Lutz and Wagoner notwithstanding). The application of lean business administration practices is the only way left to profitability for the Big 3.

It looks like lean is going to be the long-term winner in the global business game, at least from these statistics. It also seems obvious that many or even perhaps most information/support and management decision processes could benefit from lean thinking. It is a safe assumption to make that "business processes are almost always in need of improvement or redesign." The reason is that "processes evolve over their lifetimes. When initially created…they are usually quite simple and straightforward…as time goes by...changes become more complex…they begin to erode the effectiveness of the process" (Adair, Charlene B., and Murray, Bruce A., *Breakthrough Process Redesign*, AMACOM, New York, 6, 1994).

The Three Levels of Lean Business Process Management

In the Lean Performance methodology, three levels of lean business processes are considered. Each level has a specific focus, and for each level there are useful lean tools and practices that can be applied in pursuit of lean improvement. The three levels of lean business process management are:

- Lean business process strategic level
- Lean business process organizational level
- Lean business process activity level

Lean Performance is a synthesis of and alternative to other views and methodologies of both Western and Eastern lean traditions. Lean Performance ERP Project Management is a methodology that accomplishes the implementation of Lean ERP systems in environments that are either already lean or attempting a lean transformation. Accomplishing lean transformation at the same time as an ERP implementation may seem a daunting task, and it is. Ignoring the synergies present in lean transformation and ERP implementation would be MUDA,* however. The fact is, lean transformation is complete only when the management decision and information/support processes are lean. Implementing new management decision and information/support processes is the task of ERP implementation projects. Successfully implementing those processes utilizing a lean methodology will complete a lean transformation that has yet to cross the office/technology boundary.

Removing MUDA through the implementation of Lean ERP processes is always a good idea, despite protestations to the contrary by the neo-Luddites. (The Luddites were a group of English textile workers in the early 1800s who were opposed to looms and other machines being installed in the textile industry. Luddites often destroyed technology that was brought into the workplace. Since then, the term "Luddite" has been applied to those in opposition to technological progress and change. Neo-Luddism is the modern equivalent in opposition to information technology.) Many in the lean camp tend toward rejection of information technology, with MRP highest on their "no-go" list. Their opposition is baffling when one considers that MRP has been utilized in Lean Production systems in Japanese manufacturers in Japan and in Japanese transplant and supplier facilities in the United States for many years.

Cases are presented for Lean ERP and implementation of lean office processes elsewhere in this book, including "Lean and ERP: Can't We All Just Get Along?" Lean Performance champions the use of ERP/MRP in the Virtual Lean Enterprise, utilizing the Lean Commerce business process model.

In this chapter, I present the case that Lean Performance is the logical successor to reengineering and process innovation because neither of those methodologies includes lean principles, tools, and practices. Lean Performance is also an alternative to other lean methodologies because Lean Performance combines re-engineering, process innovation, and lean. Lean Performance is more appropriate to lean transformation than value stream mapping and *kaizen*, because neither of those approaches includes lean tools and practices to improve all three process levels.

Lean Business Process Strategic Level: Lean Policy Deployment

Business processes at the strategic level in the Lean Performance methodology include the four core business processes as viewed by Lean Performance:

* MUDA—Japanese word meaning "waste."

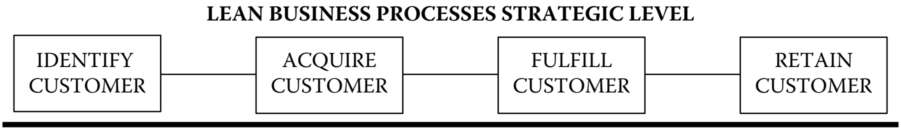

Figure 3.1 Lean Business Processes: Strategic Level

- Identify Customer
- Acquire Customer
- Fulfill Customer
- Retain Customer

Strategic business processes are focused on three business elements:

- Products
- Markets
- Synergies

Womack and Jones, the Lean Thinkers, have identified three critical management tasks that could be considered to be strategic-level processes:

- Problem-solving task from product concept to detailed design
- Information management task from order taking to detailed scheduling to delivery
- Physical transformation task running from raw material to finished product (Womack and Jones, *Lean Thinking*, 2003)

From the Eastern *kaizen* tradition, the GEMBA Thinker Masaaki Imai has proposed three major business activities that could be considered strategic level processes:

- Develop Product
- Produce Product
- Sell Product (Imai, Masaaki, *Gemba Kaizen*, McGraw-Hill, New York, 1997)

One of the major differentiators between Lean Performance and other approaches to lean transformation is that Lean Performance draws on Western process improvement methodologies, including process reengineering and process innovation. These methodologies were developed and utilized in IT implementation. Each has been singled out for scorn by lean proponents. Reengineering is loathed by Lean Thinkers (Womack and Jones), and innovation is especially singled out for scorn by Imai. Imai slams innovation as the primary failed tactic of American management in the preface to *Gemba Kaizen*. Imai further opines that process innovation is too radical, too extreme. What Imai is really slamming is process innovation as practiced by American managers, especially innovation utilizing technology (like MRP).

Imai and Womack and Jones are in agreement in their scorn of MRP. Lean Performance posits that what is wrong with MRP is that it is usually implemented incorrectly, utilized inappropriately, and "pushed" too extensively into the production workflow. A process innovation that delivers value to the enterprise is valuable, and ERP/MRP can deliver value to the process stream. Rather than throw ERP/MRP away, Lean Performance takes the view that a better implementation methodology can accomplish process innovation, utilizing technology, by incorporating the use of lean principles, tools, and practices in ERP/MRP implementation itself.

It is fair to say that reengineering methodologies had faults. In the early reengineering days, it was recognized that "a process's inputs, outputs, and goals must be easily understood by anyone in the organization" (Hammer, M., *The Reengineering Revolution*, Harper Business, New York, 18–19,1995). But, unfortunately, reengineering was also built on the premise that "each process should focus on goals and measurable outputs, not on activities and methods" (Hammer, M., *The Reengineering Revolution*, Harper Business, New York, 18–19, 1995).

This is fundamentally shallow, or arrogant, and is perhaps one source of the reengineering "problem." Simply put, how can you possibly improve workflow when all you concentrate on is the output, and not on the process that produces the output? This is analogous to focusing on the cake and forgetting that the ingredients have to be mixed properly. If information technology is being deployed to support a reengineering effort, that is like focusing on the oven and not the cake itself. No wonder so many reengineering efforts spent a lot of money on newer and better "ovens" but failed to improve the cake. Focusing on process results (goals and measurable outputs) is exactly the opposite of what lean theory espouses. In lean theory, improved processes equal improved results. You can't manage the result, but you *can* manage the process, and this is best done at a task level by the process owners and operators in consultation with the process customer. When machine enablers are being introduced into a lean environment, it is the harmony of the machine expert and the process experts working cooperatively that produces a lean process.

The primary lean practice employed at the lean business process strategic level is management policy deployment. Womack and Jones endorse *Hoshin Kanri*, the Toyota policy deployment practice. Womack and Jones are also advocates of *kaikaku*, which is a process innovation tool. When employed to radically transform the enterprise products, markets, and synergies, *kaikaku* can be considered a lean form of reengineering, although even the phrase "lean reengineering" is anathema to any lean advocate.

Lean Performance does not develop strategic improvement policies. Lean Performance is a tactical methodology. In a Lean Performance project, management policy that supports improvements in the strategic processes is deployed to the lean business process organizational and activity levels for increasingly specific improvement projects utilizing the Lean Performance analysis. Process stream mapping, a Lean Performance tool, and the SDCA/PDCA tool are used to develop process workflow standards based on these deployments. The S task of SDCA is the documentation step that produces the standard (S), which is then done, or demonstrated (D), checked (C), and implemented or acted upon (A). Acting is certainly not adjusting, as has been proposed by some in the lean community recently. SDCA is not a "continuously adjusting" lean tool. If an adjustment is desired, make a new Plan (P), and proceed. It's as simple as that. All of these activities result in lean process improvements at the lean business process activity level. The Lean Performance analysis utilized in Lean Performance is a GAP-based lean policy deployment activity that deploys top-down to the activity processes and drives process measurements bottom-up. Neither the Lean Thinkers nor their Eastern counterparts, the GEMBA Thinkers, include management policy deployment or performance measurement in their primary methodologies: value stream mapping and process standards development, respectively.

Lean Business Process Organizational Level: Lean Process Innovation

Business processes at the organizational level have been variously listed as the 9 to 18 processes of the process innovation movement of the recent past, as well as the 55 "GE" processes, and the 62 processes described by the software vendor SAP. Other software vendors package their implementation methodologies around a set of organizational processes specific to their process architecture. These processes include many of those illustrated in Figure 3.2.

Value stream mapping is a process innovation tool derivative of material information flow analysis (MIFA), developed by Toyota and others in the industrial community. MIFA is and has been in the toolkit of Western industrial engineers for many years. Value stream mapping has been primarily concerned with organizational value streams, at the organizational process level, although later explications of value stream mapping have emphasized "looking" for process improvement application. From the Eastern perspective, *kaizen* is almost solely focused on the activity-level processes, although quality function deployment (QFD) is proposed at the organizational process level by leading proponents of *kaizen,* including Masaaki Imai, who provides an overview in his book *Gemba Kaizen* (p. 38).

Womack and Jones propose value stream mapping as the lean tool to apply to the value stream to accomplish a lean transformation. The value stream is the sequence of tasks that is performed to provide service or product value (i.e., delivery). The organizational process level is not the level at which lean transformation is accomplished. The products that most often result from value stream mapping activities are complex maps of the enterprise at the organizational process level. They are interesting and useful in the evaluation of improvement projects and their enablers

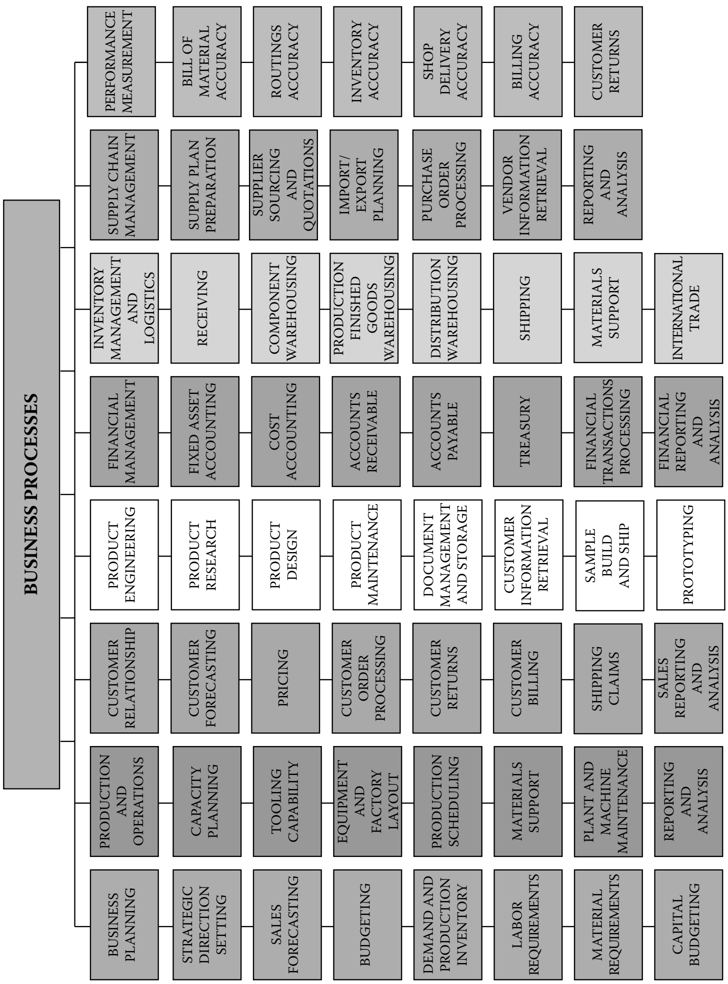

Figure 3.2 Lean Business Processes: Organizational Level

but are not useful at the process activity level for lean implementation. Many value stream mapping results have been less than stellar. Many organizations have terrific value stream maps, yet have made little or no progress toward lean transformation or implementation of lean processes at any level—including at Delphi. There, value stream mapping is not working to implement lean in the activity processes. This is especially true in the physical (factory) processes, but also in the management decision and information/support processes. A map or picture of MUDA or the desired MUDA-free future state vision is nice to have but it doesn't get anything changed. That doesn't advance the lean transformation in a company. A value stream map does not implement a new lean activity process—it isn't designed to. Finally, value stream mapping does not develop lean culture, critical to lean transformation.

Some of the confusion and lack of success of value stream mapping is the result of the various techniques that are employed by the academics and consultants who practice value stream mapping with less than adequate methodology. In addition to value stream mapping as championed by Womack and Jones, there are many other flavors of value stream mapping in use, and they are not all the same.

One important element of value stream mapping that should not be ignored is that management personnel are included in the activity. Management and supervisory personnel add innovation and ideas to process management and lean transformation, and they should not be discounted. Innovation is especially important in removing MUDA from the management decision and information/support processes. Paramount, however, is the Lean Performance principle "The Process Owners and Operators Are the Process Experts." Embracing that principle will accomplish a major shift in culture and energize the lean transformation. Endorsing this cultural principle establishes the managers and supervisors as the process owners/experts at the organizational process level, and the process operators as the experts at the activity process level.

The basis of value stream mapping is MIFA, a lean diagnostic tool developed by Toyota (and others—see Ford Value Engineering, circa 1948) more than 60 years ago to analyze material and information flow. Value stream mapping is not always the same as MIFA. MIFA was not developed to replace SDCA/PDCA; rather it evolved out of the desire to link process improvements across departments and work locations that were not easy to "see" together.

MIFA is not meant to be a process identification tool, and it is certainly not a perfect tool for identifying a process at the level at which an operator performs it. A MIFA is an overall flow of a process stream, whether that particular stream of processes is of a product, a product family, or a complex product group or job shop flow of processes. The MIFA is utilized to illustrate the entire flow and to provide insight into how multiple process streams belonging to multiple process areas of the enterprise such as manufacturing and logistics can be improved to flow together.

MIFA is utilized to generate process improvement ideas, when process standards have already been produced that illustrate the process as all participants in improvement activity agree it is performed. This is the missing ingredient in the majority of lean value stream–based improvement efforts. As the lean pioneer Ishakawa said, "There can be no discussion without a Process Standard." The value stream mapping discussions that take place in the absence of Process Standards risk poor results due to the lack of effective communication about the process, which is the case when the process is verbally described rather than visually illustrated. A Process Standard is a visual representation of the process activities required to transform a data or material input into an output needed or desired by a customer. A Process Standard is the result of the SDCA (standardize, do, check, act) cycle. The S task of SDCA is the documentation step that produces the Standard (S), which is then Done, or Demonstrated (D), Checked (C), or Implemented or Acted upon (A). Acting upon is certainly not Adjusting, as has been proposed by some Lean Thinkers. If an improvement is desired, make a new Plan (P) and proceed, It's as simple as that. There is no need to change the SDCA/PDCA tool now. It worked for Toyota, and that's good enough.

Lean thinkers propose that value stream mapping will expand the perspective of traditional Western industrial engineering process thinking to the broader activities of manufacturing "value." The Japanese GEMBA thinkers have already defined this approach with the aforementioned Quality Function Deployment (QFD). QFD is a process organizational matrix that positions traditional "vertical" structures of processes and departments into a "horizontal" structure. QFD connects processes and their tasks in the stream of process value flowing from suppliers, through the organization, and on to customers.

Although Imai does not emphasize MIFA, he expresses no opposition. For this Eastern proponent of lean, it is clearly the case that Process Standard development is completed first, utilizing SDCA.

Lean Performance agrees with the GEMBA Thinkers that it is too difficult for most companies to begin with a value stream perspective, mapping a value stream of the entire flow from raw materials coming out of the earth all the way through to the hands of the consumer. Toyota didn't start to get lean that way and Toyota-trained lean sensei don't start there either. They start the lean transformation by establishing one-piece flow, or as near to it as possible. Lean Performance utilizes lean tools to develop Practical Flow. Practical Flow results from two accomplishments. First, each process owner/operator team must identify and "lean" their own individual process(es), and second, with Process Standards in hand, process teams must identify and "lean" the processes that comprise their process stream.

The Lean Thinkers propose that the value-adding physical process flow is the primary customer that the organization level processes must serve. GEMBA thinkers would agree. In fact, they never saw it any other way. The processes found in the QFD are the organizational-level processes for the GEMBA approach. Most GEMBA Thinker process improvement or Lean Thinker value stream improvement projects have as goals the reduction of lead-time and inventory.

Perhaps the most useful contribution of the Lean Thinkers are the five lean transformational principles: *value, value–added, flow, pull,* and *pursue perfection*

(Womack and Jones, *Lean Thinking*). These five principles are useful at both the organizational process level (in MIFA or Process stream mapping) and the activity process level. Lean Performance applies these five principles within the Lean Performance Analysis. Imai delineates five principles as well: the five GEMBA principles for problem identification and resolution. They are designed to be useful at the process activity level but also can be applied in some cases to the process organizational level. They are *check the thing itself (machine, tool); take temporary measures; after temporary measures are in place, then find the root cause of defect or problem; standardize to prevent recurrence (also 8Ds); and get to GEMBA (make it quiet)* (*Gemba Kaizen*).

One GEMBA Thinker position that illustrates the difference in thinking between the Eastern and Western proponents of lean is the proposition by Imai that the removal of one part of MUDA in a process that includes one part "value-added" and nine parts MUDA effectively doubles productivity. Contrast this with the statement by Womack and Jones that 80 percent of the value stream is MUDA, but we should go ahead and map it anyway. Lean Performance proposes that the MUDA be identified and removed at the process activity level prior to beginning mapping at the organizational process level. It is a fact that this is how Toyota accomplished lean, and the way lean sensei go about it (at least the sensei who worked where I was employed).

The Lean Thinkers posit that concentrating on *overall flow* means focusing on *overall process efficiency* rather than on just the efficiency of an individual process. Lean Performance agrees, with one caveat: a single process that flows connected to another single process that flows, etc., is foundational to the overall flow. Lean Performance agrees with TPS—make each process flow, then work on overall flow.

When analyzing a process with Lean Performance, start by looking for inventory of parts or paper. Inventory tells you where a flow is interrupted. Once you have found these spots in your process stream, the next question is "Why does the flow stop here?" Then get the team to suggest a way to get the process material or data to flow. Inventory reduction results when less WIP is needed to maintain delivery in a process stream that flows faster. As the processes in a process stream become more closely linked, there is progressively less buffer between them. Although this improves *D*, it makes a process stream sensitive to problems. Also, wherever a process is not one-piece flow, inventory buffers must support process variations.

In Lean Performance analysis, we assume that if an administrative process is necessary (i.e., value added or nonvalue added but required by management or regulation), then we should apply process lean diagnostic tools in order to "lean" these administrative processes and improve the QCD (quality, cost, and delivery).

Lean Performance assumes that, in order to be effective in leaning administrative (management decision and information/support) processes, the customer value-added question must be answered from the perspective of all of the stakeholders, not just the ultimate customers. Otherwise, we would classify most of these processes as NVA (nonvalue added). Taken from the point of view of the owner, or all employees, the processes that keep us in business *are* value added.

The Lean Thinkers, GEMBA thinkers, and Lean Performance all agree that a significant amount of the order cycle time occurs in management decision and information/support processes, before the order even reaches the shop floor. This process stream is the "administrative," "service," or "white-collar" process stream. Here, too, WIP material (orders, specifications, directions, labels, etc.) sits in inventory (in-baskets, desks) and doesn't flow.

All organizational level processes can be analyzed and "leaned" to improve QCD by starting with one key question: How should this process or stream of processes enable the shortest possible lead-time? An example of the process stream view of manufacturing can be illustrated by measuring the lead-time of two different process streams: physical process cycle time, which is the time it takes to go from raw material to shipment (or from "our dock to the customer's dock"), and customer order cycle time, or the time it takes to go from a customer order entry to fulfillment, including paper flow.

Lean Performance utilizes process stream mapping to analyze the organizational level processes and to identify the activity level processes within them. Process Standards are developed, and team members evaluate process control points where key software features or other enablers can be applied. Process stream mapping is utilized in the Lean Performance methodology for management decision processes as well as information/support processes. MIFA is utilized by Lean Performance to document physical processes and their information/support linkages.

Process stream mapping is the documentation of the flow of information and material through the stream of processes that produces a good or service. Lean Performance takes the view that value stream mapping is the wrong tool to utilize first in a lean transformation. The first lean practice to be utilized in lean transformation is Process Standard development and documentation. Why? Because the development and documentation of a properly accomplished Process Standard delivers a "MUDA-free" process to be then documented in the process stream map and further improved. As Womack and Jones state in *Lean Thinking*, 80 percent of any process is nonvalue added. So why document or map the "MUDA stream"? Starting lean transformation here wastes time and doesn't address the two critical elements of lean transformation: lean culture and lean Process Standards. Lean Performance recognizes that process stream mapping is a valuable tool, just not the only or even most critical tool in lean transformation. Lean Performance ERP project management completes process stream mapping in the evaluation/selection of a software module but considers these process stream maps to be inadequate for system implementation. Although process stream maps are good input to process identification, Lean Performance utilizes the input of the process owners and operators to fully develop the implementation process listing. Lean Performance then develops Process Standards at the process activity level. After Process Standards are completed, process stream mapping is a useful tool to evaluate and develop linking

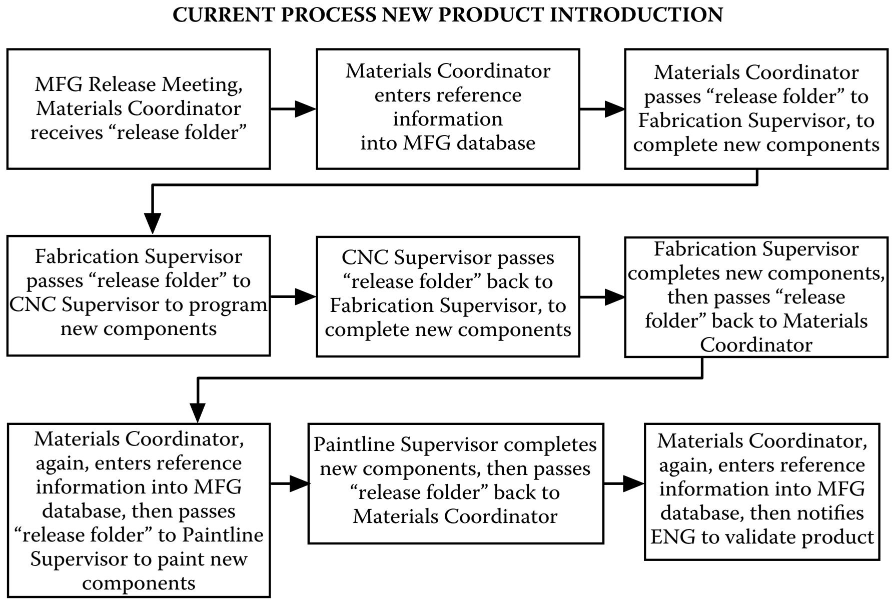

Figure 3.3 Business Process Example: Organizational Level

lean practices in pursuit of lean flow. In *Lean Performance ERP Project Management*, process stream mapping is utilized to map the management decision/information support process stream in the enterprise, and develop and present the key lean features for implementation.

A process stream map is also extremely useful when used with process owners and operators to identify opportunities for lean improvement, and the activity level processes where those improvements might be implemented. In Figure 3.3, an organizational level process is illustrated.

There are two key elements in the illustration. The first is that the boxes are developed and presented in a "flow"—this is the order in which the process is designed to be performed in the organization. The second key element is to recognize that each box illustrates either an organizational process that can be and is performed "as shown," without any other activity processes being performed. For example, "MFG release meeting, materials coordinator receives 'release folder.'" There is nothing more to be said (or done) here. Generally, the boxes do not illustrate that, and most organizational processes are in fact collections of activity level processes. An example of this is "materials coordinator passes 'release folder' to fabrication supervisor, to complete new components." No mention is made of the activity level processes that complete the new components. Developing a process stream map does not get the following activity level processes lean. Another issue with process stream maps is that management and supervisors usually develop these process stream maps without the involvement of the process operators. The

ORGANIZATION PROCESS LEVEL
ENGINEERING CHANGE PROCESS MUDA

- Release folders have long travel distances
- Release hand-off meetings occur in batches
- Release hand-off meetings use human resources inefficiently—Sit, Wait, Contribute
- Process has long cycle time
- Process is confusing & overlapping

Figure 3.4 Engineering Change Notice: Process MUDA

process operators may not organize their work in the flow that management and supervisors have designed or think is being done.

The lean diagnostic tools include those applied once at the inception of a team *kaizen* or other activity, and then occasionally in continuous improvement activities. The lean diagnostic tools include the 5 Ss, 3 MUs, 5 Ws-1H, 4 Ms, process stream mapping, and MIFA. Application of the lean diagnostic tool of the 3 MUs Checklist (included later in this book) to an organization level business process yields the results illustrated in Figure 3.4.

Application of the 5 Ws-1H Checklist (also included later in this book) can produce a result like that in Figure 3.5. Performing this organizational level process review utilizing the 5 Ws-1H Checklist has uncovered a wealth of information about the process to this superlative team effort.

Innovative Lean Performance teams engaged in the application of lean diagnostic tools can also create innovative ways of employing the tools, such as the example illustrated in Figure 3.6.

Further review of the engineering change notice process illustrated in Figure 3.4 reveals additional organizational level flow boxes or collections of activity level processes. These are illustrated in Figure 3.7. Iterative development of process flows at either the organizational level or later at the activity process level will almost always uncover additional tasks that are either unknown to the management and supervisory personnel or overlooked during the first pass. Enlisting the process operators will nearly always reveal more collections of tasks. With the current process flow in hand, an examination of the previously uncovered MUDA makes the framework for future process state obvious. This is illustrated in Figure 3.8.

Finally, benefits are developed that will be obtained by the team when the new process is implemented. These are illustrated in Figure 3.9. Later, at the activity level, teams will determine the actual savings generated in a process measurement that management can convert to financial data. Lean Performance measures the process activity level in measurements that are visible and available to the process owners and operators. The results speak for themselves.

ORGANIZATION PROCESS LEVEL SUPPLIER SELECTION & QUALIFICATION
5 W's 1 H CHECKLIST RESULT

TASK	DESC	OWNER	Customer	WHO (does/Involved)	WHAT (Goal of process)	WHERE	WHEN	WHY	HOW
1	Request Comes in-new f/g Outsource	Purchasing	Review Team	(A) From upper mgmt to?	(A) Outsource new product	n/a	Determined in request	Capabilities, cost, loglstics, etc.	Phone, email, verbal, etc.
				(B) From Engineering?	(B) Change Suppliers	n/a	Determined in request	DCQ problems with existing supplier	Phone, email, verbal, etc.
				(C) Who does request go to?	(C) Support spec change	n/a	Determined in request	? Doesn't really fit?	
2A	Request Review Meeting	Review Team	Requestor	REQ'D-Engr, Purch, Prod Mgmt.	(A) Discuss request details (scope, timeline, etc.)	At Gemba, ideally	Shortly after step 1	Communicate "why" in above step & define desired results & distribute minutes so all informed	Various dep on scope-verbal, to emails, to meeting(s)
				OPT-Prod, Qc, Mkt, Sales, Fin	(B) Determine Information required-step 3 below	At Gemba, ideally			
3A	Project Data Collection	Review Team	Data Organizer-who needs output	Engr & Purch minimum. Ops, Fin, QC, usually Involved too. Sales not normally	Drawings, specs, samples, cost targets, EAU, delivery requirements, QC requirements, Fin Requirements, supplier background, etc.	At Gemba mostly	For a period after step 2A	Information needed to continue	Research, discussions, meetings, emails, etc.

Figure 3.5 Supplier Selection Qualification 5 Ws-1H Checklist Result

ORGANIZATION PROCESS LEVEL SUPPLIER SELECTION & QUALIFICATIONS 4M CHECKLIST

- 4M on A New Supplier:
  - – Manpower
    - Who?
    - Enough?
    - Qualified for our parts?
  - –Machine
    - What capability?
    - New/Modern?
    - Fit for our parts specifications?
    - Fit for our process specifications?
  - –I/T Connectivity/Compatibility (for CAD, CAM, Quality)

Figure 3.6a

ORGANIZATION PROCESS LEVEL SUPPLIER SELECTION & QUALIFICATIONS 4M CHECKLIST

- 4M On A New Supplier (cont.):
  - – Material
    - Can they use the material we specify?
  - –Method
    - Are their processes lean?
    - Are their processes cost/quality/delivery effective?

Figure 3.6b Supplier Selection 4 Ms Checklist Result

Lean Business Process Activity Level: Lean Performance Implementation

In *Gemba Kaizen*, Imai states that results-oriented thinking is the Western/American management approach. For the Eastern lean proponents, process-oriented thinking brings results by determining *what* we do or need to do, then *how* best to do it. For Imai, GEMBA, or the place where the work is done, is the place where all value is produced. GEMBA is also the office. Imai states that the source of lean power is GEMBA and the value-added people in GEMBA, and GEMBA always wants to do better.

According to Imai, GEMBA is where the American worker fails. Imai places the blame on American managers, who do not listen to and learn from their workers. In the Toyota Production System (TPS), the job of managers is to develop, maintain, and improve standards (process standards, standard work) in quality, cost, delivery, morale, and safety. Imai repeatedly reminds us that managers must go to GEMBA for the facts, utilizing lean tools such as the chalk exercise, process standards, and the various lean diagnostic tools. GEMBA Kaizen is operator driven. Japanese management is cooperative, not competitive like American management. The bottom line for Imai is that Kaizen is the power of common sense.

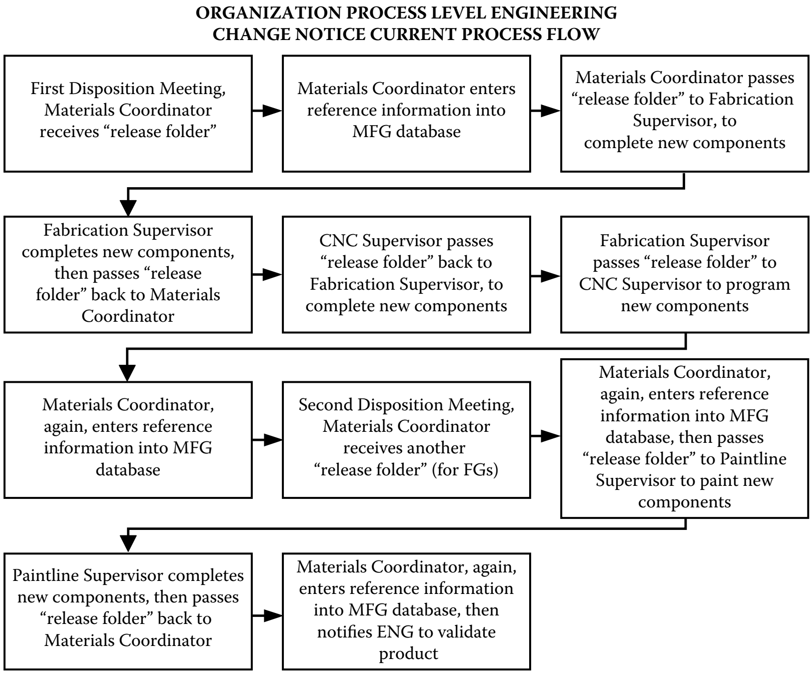

Figure 3.7 Engineering Change Notice: Current Process

ORGANIZATION PROCESS LEVEL
ENGINEERING CHANGE NOTICE
FUTURE STATE WITH MUDA REMOVED

- Fewer paperwork forms
- Release Packets have shorter travel distances
- No more Release Meetings that were an inefficient and costly use of human resources
- Less waiting and queue time as One Piece Flow reduces Proces Cycle Time
- No more confusion over which process to follow—adhere to the Process Standard

Figure 3.8 Engineering Change Notice: Future Process State

Lean Performance operates in agreement with that sentiment and further posits that "whatever it takes" management doesn't bring results either. Lean Performance embraces the idea that lean is "the *empowerment* of common sense." The best way to perform and improve a process, according to the Western tradition running through from Taylor and Ford and extended by the Lean Thinkers, is "We'll tell you," we being management and supervisors. The Eastern tradition from Deming and Ohno is "You tell us." Lean Performance embraces that thinking.

ORGANIZATION PROCESS LEVEL
ENGINEERING CHANGE NOTICE
PROCESS LEAN IMPROVEMENT BENEFITS

- Working concurrently reduces Eng to Mfg hand off process cycle time-reducing time to market for new products and changes to products > Delivery-Cost
- Streamlining Eng to Mfg hand off process reduces overlapping processes and decreases confusion by assigning ownership of tasks > Quality-Cost
- Moves company toward more professional management with Process Standards and clear established responsibilities for employees > Quality

Figure 3.9 Engineering Change Notice: Lean Benefits

Although suggestion systems or *kaizen* activities can also generate improvement ideas, it is always necessary to drill down to the process owner to improve an organization level process. It is also necessary to drill down to the process operator level in order to improve an activity level process. At the operator level, a process is a structured sequence of tasks designed to transform an input (material or data) into an output (product or service). A lean process does that without wasteful work steps or material and time consumption. It's as simple as that. When process owners do MIFA across departmental or geographic boundaries, care must be taken to ensure that the improvement effort does not lose focus and revert to reengineering or process innovation with the "experts" making process activity decisions, not the operators.

The final point of difference between the GEMBA Thinkers and the Lean Thinkers is performance measurements. The GEMBA approach is to measure at the process level, not at the results level. GEMBA or *kaizen* process improvement projects quantify success in three key process measurements: quality, cost, and delivery. Performance measurement of QCD is the mantra of *kaizen*. An essential belief of the process-oriented manager is that by improving the process (any process—each process—all processes) we improve the result. In addition, Imai discredits financial managers because they rely too much on data and not enough on GEMBA observation. Reports and instruments are only "secondary observations."

In the lean enterprise, all activities are measured in terms of how they support or improve the quality, cost, and delivery metrics of a single process, a group of processes in a process area, or the entire set of processes in the process stream. For example, a meeting is not a process unless it has an input, transformation of material or data, and an output that a customer would buy. How would the meetings in your enterprise meet this standard? How could they be improved? What about the value-added criteria?

The Lean Performance methodology links management strategy deployment to the organizational process level through the development of process stream maps. The Lean Performance analysis builds from process identification and MUDA removal to the broader application of lean diagnostic tools across the process stream. Lean Performance Analysis has two key process components:

1. Process Standards development, which leads to a better understanding of process and improvements in the flow of a process
2. Process stream mapping, which leads to a better understanding of overall process stream flows and incrementally improves the process stream flow until it is a customer pull

Process stream maps are utilized to identify lean improvement projects, and the activity level processes to work on, as well as the process teams to do the work. A key fact of lean implementation that Lean Performance is based on is that no one but the process owners and operators can draw the maps or complete the Process Standards. That's the way Toyota does it. These Process Lean Performance measurements are then reported to management, and a new cycle of strategy deployment begins. As demonstrated by the Lean Performance teams that developed the listing in Figure 10.7, a process is best identified as such by the operator or team that performs it. This includes the business planning process and other management decision and information/support processes also.

A process stream mapping exercise is included in the chapter titled "Evaluating and Selecting Software Modules." Key features for Lean ERP are developed through process stream mapping exercises and illustrated in figures in that chapter.

The best time to redesign processes with Lean Performance is when processes have acquired extra steps, including redundant and check steps, especially at barrier hand-offs. Another good time is when processes have responsibility divided among multiple owners or co-owners, and no one is identifiably responsible for process outputs and quality. In a process in need of Lean Performance, downstream processes are not supported fully. There are numerous approval steps. Specialists have emerged in functional silos (departments). No one has the authority to correct his or her own process and restore it to effectiveness. Queues are lengthening at various tasks, and process time is increasing. Clearly, "something" needs to be done.

Lean Performance cannot be accomplished unless the foundation for lean transformation is already in place. When there is a machine breakdown, absenteeism, defective parts, or another problem in one process of a lean process stream, with less WIP it will take less time before these problems adversely affect other processes. In an emerging Lean Production or supply-chain process stream, processes are more closely linked. Any impediment to flow requires swift, local response to problems before downstream processes are impacted. Swift response means swift awareness of abnormalities, personnel assigned to responding, and a structured approach for how to respond to problems.

Often, a program of preventive maintenance is required in order to sustain the machine and process up-time needed by practical flow. Also, rapid setups are needed, because the fact may be that more setups are needed more often *and* that a process can't shut down for long setups and maintain delivery.

The final frontier for lean transformation is executing to customer pull. Implementing customer pull can only occur when process streams flow. It becomes apparent that there are numerous process streams in every enterprise, once each process and its linkages to other processes are examined. To achieve customer pull, all of these process streams must flow. Use of lean practices in developing customer pull includes Customer TAKT, widely misunderstood and misapplied. A lengthy discussion of Customer TAKT and its corollary, Operations TAKT, is included in the chapter about Lean Commerce. Supply processes also must flow, and this always involves partnership and cooperation with partners. The Lean Thinkers propose that once you have initiated flow and lead-time improvement inside the four walls of your facility, you can start expanding your view to include your supply chain. The impact of supply-chain dependence for QCD improvement has long been a major element of the GEMBA Thinkers. Many enterprise partners can be included in Lean Commerce implementation and the resultant Virtual Lean Enterprise.

What Is Lean Performance?

Lean Performance is a management strategy that recognizes and leverages the fundamental strengths of any business: the people and processes. The goal of Lean Performance is to produce lean processes by determining value-added process tasks and then define the use of a vendor-supported unmodified software as the process enabler.

In the Lean Performance methodology, management policy deployment aligns lean policies and strategies with the decision and action processes that execute tasks, including those enabled by information technology. Lean policies and strategies about mission, markets, products, and services are deployed to a process level in the Lean Performance methodology. These decision and action processes include all organizational processes in company process areas and activity processes at a task level. Where information technology is involved as the process enabler, at a task or group of tasks, these transactional processes at the data level are also improved.

Lean Performance is a synthesis of the three dominant business improvement methodologies being utilized by business consultancies today:

1. Business process reengineering
2. System innovation
3. Lean

Lean Performance is a *business process improvement* methodology in that it utilizes the best techniques of business process reengineering to identify and implement lean business strategies to identify enterprise process architecture. Lean Performance is also a *system innovation* methodology in that it provides an IT project management workplan and toolkit with the task list necessary to implement IT projects. Lean Performance is, finally, a *lean* methodology that develops Lean Performance teams

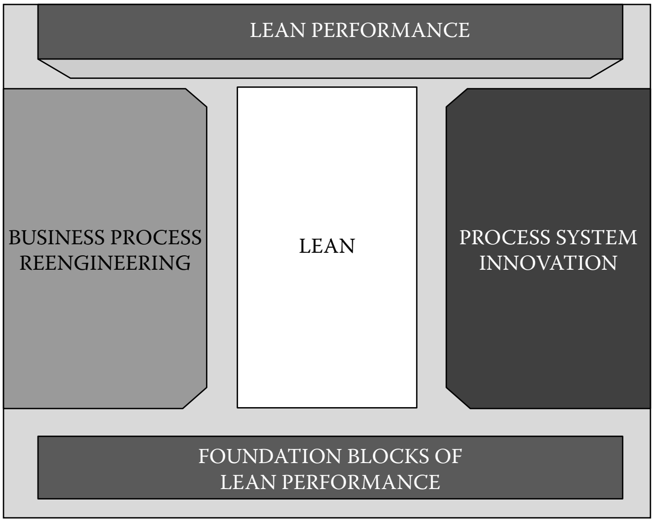

Figure 3.10 Lean Performance Foundation Blocks

of process owners, operators, and customers who perform value-added lean process improvement, in the process eliminating waste from existing management decision, information/support, and physical processes as well as facilitating development of information processes that support lean physical processes. The final result of the Lean Performance project is an ongoing continuous improvement process resident in the enterprise, managing the process of managing processes, after the initial project is successful and is illustrated in Figure 3.10.

Above all, Lean Performance is a lean business process improvement and system implementation methodology that integrates IT innovation with lean principles, tools, and practices. The philosophical inspiration for Lean Performance is found in this comment from one of the giants of lean management: "When western management combines *KAIZEN*® with its innovative ingenuity, it will greatly increase its competitive strength" (Imai, *Gemba Kaizen*, 1997) (see Figure 3.11).

The Lean Performance methodology presented in this book can develop process performance measurements and continuous Lean Performance where information technology has already been implemented or as the implementation methodology for new information technology initiatives, including ERP, MES, OPS, CRM, and supply-chain management (SCM) systems implementation. It also leads to a process-oriented management that can effectively leverage the newer EIS (executive information systems) or other data-driven management information tools.

The output of Lean Performance is lean processes because these processes deliver added customer value, have no waste remaining to eliminate (until next time), can be measured and can be continuously improved.

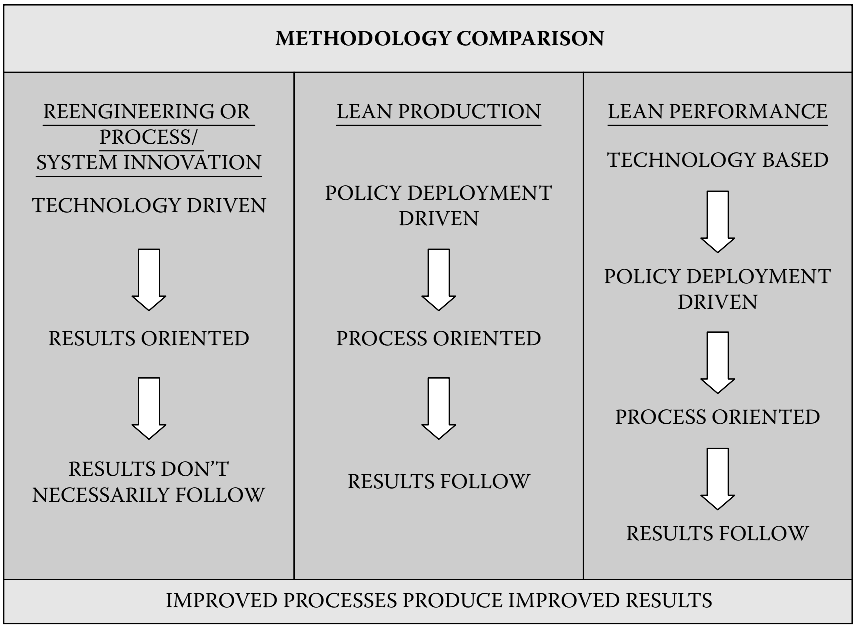

Figure 3.11 Comparison of Reengineering, Lean, and Lean Performance

How Does Lean Performance Improve Processes?

Lean Performance begins with four questions:

1. What constitutes maximum value to the customer: either the external product customer or the internal process customer?
2. How can the process owners and customers be effective in a project of process improvement?
3. How can we identify areas and processes for improvement?
4. How do we implement IT-enabled process changes successfully?

The overriding strategy of the Lean Performance methodology is to start with existing processes and develop process improvements that adapt the enabling information technology to the business, not the business to the information technology. We begin by deploying lean business policies and strategies to the management decision, information/support, and physical process levels. Next we identify process owners and customers, all process owners, operators, and all processes. Following the modules of the project plan, we will complete a Lean Performance Analysis, a lean value-added process analysis for all the processes identified, utilizing a lean SDCA process for each, followed by a PDCA of continual improvement. In the project, teams produce process standards, including process workflow and work instruction standards, that document information/support and management decision processes, as well as the physical processes they manage, inform, and support.

Lean Performance teams will learn and utilize practices that apply unmodified vendor-supported software to leverage standard software packages present in the environment, or obtained for deployment within the project. These can include any or all of the aforementioned ERP, MES, SCM, or OPS software, following the project workplan task definition. Teams will identify, analyze, and close process and system gaps as well as establish a process-oriented performance measurements process to verify improvements necessary to improve cost, quality, and speed. Finally, we introduce a practice that continually deploys management policy to identify and implement new opportunities.

In the project, management decision, information/support, and physical processes are “leaned” by integrating “disconnects” and by eliminating nonvalue-added tasks at process boundaries (checking, counting, verifying). The enabling software is applied so that it provides greater information visibility, availability, accuracy, and timeliness throughout all processes. We will endeavor to develop flow in all processes by eliminating batches and queues, and we will especially emphasize developing information/support processes that support lean physical processes, including “pull” information for one-piece flow. We will not execute a “perfect” implementation, where every process is supported at the 100 percent optimum level by the software. We will be constrained by the capability of the software we employ and will be moving so fast that we will not have time to wait for modifications. We will develop solutions to “missing” features as we go, including manual workaround. We will maintain the software in an unmodified state, both because it is easier to implement and maintain (including application of vendor-provided upgrades) and because that approach facilitates partnering with the software vendors and their expert staffs. We will assume, however, that they are only the experts on the data processes contained in the enabling software tools. We will take full responsibility for the process definitions, using our process experts, the process owners, operators, and customers who perform the processes every day.

Why Lean Performance Is the Best Lean Methodology

Before we begin, let’s back up a bit and evaluate the methodology against previously existing methodologies briefly touched on above.

Process redesign is the activity that changes processes by changing process enablers. Some examples of process redesign methodologies mentioned earlier are business process reengineering, process innovation, and system innovation.

In experience, process redesign methodologies often fail or deliver poor results that negatively impact customer quality. Internal customers lack critical information. External customers often suffer impact to cost, quality, and delivery performance. Often a process redesign may turn out not to be a process performance improvement. To be considered a process improvement, an improved process must be implementable from where your firm is today, not from where your firm proposes to be "after" the reorganization, merger, acquisition [Your Situation Here].

Often, process redesign is driven by the desire or perceived need to add a feature to a process. The addition of a feature to a process that doesn't add value from the customer perspective is a process redesign but is not a performance improvement. This phenomenon often results from the "technology solutions in search of problems to solve approach" and generally creates more problems than it solves, and creates them later, and more expensively, than planned. This partially explains the dotcom meltdown. There weren't enough paying customers who needed all that "neat" stuff. And when there were, the vaporware phenomenon rampant in the mania and resulting lack of actual product to ship drove them away, often never to return.

Let's return to the discussion of methodology, especially the methodologies that underlie the less than optimum deployment of all that software referenced above. The evolution of traditional business management theory coupled with the emergence of information technology resulted in *business process reengineering.* In this methodology, process redesign is performed top-down in the organization, based on the recognition of four core processes. As has been demonstrated in numerous sites, this approach can work on management processes but generally requires extensive custom software development for use in manufacturing.

The evolution of information management theory resulted in the Process Innovation and Systems Innovation (RAD-JAD) approach. Based on the recognition of 9 to 18 core processes, these methodologies rely on a process where system design takes place before process design. Generally, this deployment methodology also requires extensive custom software development. Again, its success is not widely demonstrated (dotcom, anyone?). Neither of these methodologies develops lean processes or culture either, and they are difficult to utilize in an enterprise that is getting lean.

Each of these approaches is supported by a number of methodologies, and many of these methodologies mix terminology, tasks, and steps freely. The common assumption that reengineering and process or system innovation share is that by changing the process enablers, you can change the process. Lean Performance is the only process redesign methodology that proceeds from the assumption that a process redesign can be successful using new systems enablers only after we know what the value-added process is, according to the process owners and operators. The process redesign (*what* needs to be done) must precede the system design (*how* we will do what needs to be done).

Process and System innovation are not really business process redesign methodologies, because they redesign underlying data processes, not the management decision and information/support business processes themselves. The data processes redesigned by these methodologies are not utilized to perform the operations that produce products or services, although they may enable them. Here's an example.

A grinding process is utilized in the Boilerplate Company to prepare its product: boilerplates in various shapes and sizes for shipment. The enabler of the process is a grinding machine that is utilized by the grinding process operator to grind the individual boilerplates. The enabling process performed by the grinding machine is to rotate the spindle of a shaft to produce a circular motion on a wheel attached to a holder on that shaft that is held against the boilerplate by the process owner. This is analogous to a data process performed by the computer that provides data to the customer order entry process. The process of grinding itself includes the tasks that are performed by the operator to select the boilerplate to work on next, to lift and position that boilerplate, to place or move the boilerplate against the grinding wheel, to turn and shift the boilerplate against the wheel in whatever series of movements the process operator, who does this task several hundreds of time per day, has determined to be the sequence that best grinds the boilerplates. So the customer order process, in which a process operator, who performs the process multiple times per day, utilizes an enabling data processor to "grind" the data, but whose expertise at performing the customer order entry process includes selecting the orders to be entered, the sequence, the specifics of each order according to the vagaries of each customer, as days, weeks, months, or years of experience have made it apparent to the process operator.

The data processes enabled by software do support the management decision and information/support processes of the company, but should not be mistaken for them. Process and system innovation work well on the data processes, but not so well on the actual processes of the business where the value-added work really happens. As we have seen above, with enough rework, the data process eventually is accepted by the process operator. What Lean Performance does is place the process operator functionally into the process definition cycle early, with process standards tools called the process workflow and work instruction.

An ERP, MES, OPS, SCM, CRM, or other system installation project masquerading as a process or system (innovation) redesign is a probable failure. This recipe for disaster can be identified by the project investment emphasis. The project budget will emphasize hardware, systems technical consultants, and business experts rather than team-based process, value-added analysis training and activities.

Reengineering has a different problem. Properly executed, reengineering assumes that we can write as much software as we need. The sometimes complex business process redesign is almost always completed by experts from outside of the affected business, and only then are ideal data processes programmed with enabling code (but who can afford that?). In IT implementation projects, the lack of involvement and ownership by the process owners and operators is the overwhelming reason for project failure. Figures 3.12 through 3.17 illustrate some other comparisons of implementation issues.

Because lean manufacturing is so successful, and technically driven improvement and implementation methodologies often aren't, isn't it about time we started to apply lean thinking to the data-enabled processes in the enterprise?

METHODOLOGY COMPARISON	PROCESS REENGINEERING	PROCESS/SYSTEM INNOVATION	LEAN PERFORMANCE
TYPICAL SCOPE	ORGANIZATION WIDE	DEPARTMENT OR AREA-WIDE	PROCESS BY PROCESS
RISK	VERY HIGH	HIGH	LOW
TIME REQUIRED	EXTENSIVE	EXTENSIVE	MODERATE
PARTICIPATION	TOP-DOWN	TOP-DOWN	DEPLOY POLICY, THEN BOTTOM-UP

Figure 3.12 General Methodology Comparison

Lean thinking is value-added thinking from the process customer perspective. The evolution of Total Quality Management has resulted in lean theory and lean thinking. In lean thinking, process orientation and team development are the basis of change. Lean thinking is usually employed today on physical processes, but it is the assumption of Lean Performance that any process is eligible. Lean thinking develops lean processes and culture, something not accomplished or accommodated by the other methodologies discussed. A critical element in choosing to utilize the Lean Performance approach for any lean environment is the fact that using an approach that doesn't center on process owner and operator empowerment is alien to the lean culture already in place, and probably detrimental to the bigger strategic directions of the enterprise. A change for the better is always the choice, even when that change takes a little longer to perform yourself than to bring in from the outside.

Lean thinking is not applied often to management decision and information/support processes, primarily because processes must be identified before they can be improved. Unlike the physical processes that can be observed and are obvious, a

STRATEGIC ISSUES COMPARISON	PROCESS REENGINEERING	PROCESS/SYSTEM INNOVATION	LEAN PERFORMANCE
SUCCESS REQUIRES	MANAGEMENT COMMITMENT	MANAGEMENT COMMITMENT	ORGANIZATION COMMITMENT TO CULTURAL CHANGE VALUE
TYPICAL SCOPE	ORGANIZATION-WIDE	DEPARTMENT OR AREA-WIDE	PROCESS BY PROCESS
PROCESS BASIS	4 CORE PROCESSES	9–18 CORE PROCESSES OR "BEST PRACTICES"	AS IDENTIFIED BY PROCESS OWNERS AND CUSTOMERS
RISK	VERY HIGH	HIGH	VERY LOW

Figure 3.13 Strategic Issues Comparison

process architecture is a prerequisite to applying lean thinking to information/support and management decision processes. An IT infrastructure is also necessary.

To be competitive, today's successful business must have timely and accurate information about customer demand and internal supply. It must increase capability to service customers with a quality response at a competitive price. It must rapidly improve processes to meet or exceed changing customer requirements. The processes that any organization uses to meet the customer's requirements must be visible and readily adaptable to customer changes, including information-based processes and physical processes dependent or linked downstream from information-based processes. Increasingly, processes are tightly linked, both with customers as well as with suppliers.

Many companies successfully apply lean principles, tools, and practices to continuously improve production processes. However, what we have seen is that too often information technology does not readily enable improvements in information/support and management processes. Information technologies do not readily or easily allow for process focus or orientation.

When we look a little deeper, we find that many IT projects and the information systems that result from them also have two other recurring problems:

1. Business strategies are not implemented by system installation.
2. Processes that result cannot be readily changed to changing customer requirements.

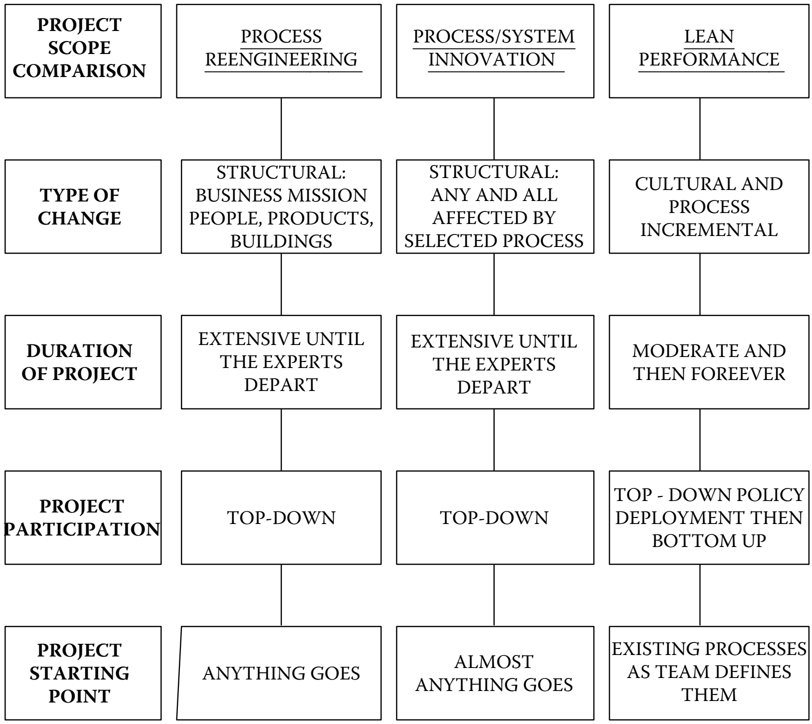

Figure 3.14 Project Scope Comparison

Business strategies may be defined at the beginning of IT innovation projects, but they are usually forgotten in the maze of project detail for two reasons:

1. They are not deployed through the project methodology.
2. They become secondary to deadline and budget pressure.

Today, businesses are organized around business processes, but IT projects often still install technologies focused on *data*, or *transcactional processes*. This introduces a “disconnect” between the actual business processes and the information system and produces a “data” system and processes that do not adequately support the actual business processes that are the customers of that data.

Data processes that result from these approaches usually cannot be readily changed to rapidly adapt to the business customer, often because the rework that accompanies the eventual acceptance of the process by the process owner and operator defeats the integrity of the underlying software design, and the “spaghetti” that results is impossible to unravel without huge expense. IT budgets are then consumed, maintaining code that comprises a fraction of the process support provided by the software packages or system architecture as a whole. The data processes and the management decision and information/support processes they enable are usually not documented, there are no “standards,” and there is no viable path of

TACTICAL ISSUES COMPARISON	PROCESS REENGINEERING	PROCESS/SYSTEM INNOVATION	LEAN PERFORMANCE
TEAM STRUCTURE	DOMINATED BY BUSINESS AND INFORMATION TECHNOLOGY EXPERTS	DOMINATED BY INFORMATION TECHNOLOGY EXPERTS	PROCESS OWNERS AND CUSTOMERS WITH EXPERT FACILITATION
METHODOLOGY	VARIOUS BUSINESS MODELING BASED PROCESS REDESIGN	VARIOUS SYSTEM MODELING BASED PROCESS REDESIGN	SDCA/PDCA PROCESS IMPROVEMENT BEFORE SOFTWARE
SYSTEM TOOLS	ANY AND ALL	DATA-BASES, CASE TOOLS, CUSTOM CODE AND VENDOR SUPPLIED SOFTWARE	UNMODIFIED VENDOR SUPPLIED SOFTWARE
SYSTEM FUTURE	CUSTOM CODE	MODIFIED VENDOR SUPPLIED SOFTWARE NOT UPGRADEABLE	UNMODIFIED VENDOR SUPPLIED SOFTWARE BOLT-ON REPORTS AND ENHANCEMENTS

Figure 3.15 Tactical Issues Comparison

communication between the process owners and the technologists who support them. Information systems often become heavily customized and difficult, time-consuming, and costly to improve. Standard vendor-supplied and vendor-supported software is not leveraged to best benefit over the long term.

Many business process reengineering, system or process innovation, and other process redesign and process improvement projects fail due to poor project methodology. Methodologies aren't really redesigning the process as the process operator and process owner understand it. Experienced project managers often are thrown at a project without a complete task list (workplan). New project managers are also fed to the lions, susceptible to making old mistakes in new, creative, and faster ways.

As we have seen, when other process redesign methodologies are technology driven, not process oriented, they put the technology first and then discover that the data processes don't fit the business processes. Process workflows (standards) are not completed by process owners and operators to first identify *what* work must be completed and then mapped to the software to determine *how* to do the work. Major software modifications to vendor-supported software often result, complicating later support. In conclusion, IT projects must implement business policies and strategies. IT systems must be business process oriented and utilize a project workplan with a complete project task list. All business processes that result,

QUALITY ISSUES COMPARISON	PROCESS REENGINEERING	PROCESS/SYSTEM INNOVATION	LEAN PERFORMANCE
DEFINITION OF PROCESS REQUIREMENTS	PROCESS REQUIREMENTS DESIGNED BY OUTSIDE BUSINESS EXPERTS	PROCESS REQUIREMENTS DESIGNED BY OUTSIDE TECHNICAL EXPERTS	PROCESS REQUIREMENTS DEFINED BY LOCAL OWNERS/CUSTOMERS
PROCESS OWNERSHIP	EXECUTIVES AND REENGINEERS	EXECUTIVES AND INNOVATORS	LOCAL PROCESS OWNERS AND CUSTOMERS
QUALITY OF RESULT	NEED FOR REWORK IS EXTENSIVE	NEED FOR REWORK IS EXTENSIVE	NEED FOR REWORK IS MINIMAL, BUT IMPROVEMENTS WILL BE CONTINUOUS
QUALITY DOCUMENTS	NONE PRODUCED	NONE PRODUCED	ISO-QS WORKFLOW STANDARDS AND WORK INSTRUCTIONS

Figure 3.16 Quality Issues Comparison

management decision as well as information/support, must be documented and have Process Standards. Unmodified vendor-supplied software must be leveraged to the long-term benefit of the business.

The Lean Performance methodology provides a solution to the usual project chaos. The methodology we are about to utilize implements business strategies and is business process, not data process, oriented. It utilizes a project workplan with a complete task list. It produces and uses Process Standards (workflows/value-added process analysis) to identify *what* work tasks must be completed. It relies on a 95 percent principle (i.e., standard software should accomplish 95 percent of our process requirements, without having to resort to modifications). Where the software package does not enable a lean process at 100 percent of process requirements, a GAP analysis is required to cost *and* benefit justify any modification. Frankly, modifications and custom programming sink implementations. In other than outstanding cases of benefit, the approach is to develop workaround solutions. Finally, by value-mapping the process workflow standards to determine *how* to perform the tasks with the enabling information technology, this approach produces work instruction standards to provide for training and to audit continued process quality. The implementing lean enterprise can then utilize these Process Standards to enable ongoing continuous improvement.

RESULTS COMPARISON	PROCESS REENGINEERING	PROCESS/SYSTEM INNOVATION	LEAN PERFORMANCE
CONTINUOUS IMPROVEMENT POSSIBLE AT PROJECT END?	ONE-TIME CHANGE NO CONTINUOUS IMPROVEMEUNT POSSIBLE	ONE-TIME CHANGE NO CONTINUOUS IMPROVEMENT POSSIBLE	IMPLEMENT, THEN CONTINUOUS IMPROVEMENT
STATUS OF SYSTEMS AT PROJECT COMPLETION	WHEN THE EXPERTS DEPART, THE MAINTENANCE IS YOURS	WHEN THE EXPERTS DEPART, THE MAINTENANCE IS YOURS	PROCESS ORIENTATION VENDOR UPGRADES POSSIBLE
STATUS OF PROCESSES AT PROJECT COMPLETION	EXPERT DESIGNED INFORMATION BASED PROCESSES AND STRUCTURAL CHANGES	EXPERT DESIGNED INFORMATION BASED PROCESSES AND STRUCTURAL CHANGES	PROCESS OWNER DESIGNED-PACKAGE BASED INFORMATION PROCESSES
STATUS OF CULTURE AT PROJECT COMPLETION	NO CHANGE OR NEGATIVE CHANGE	NO CHANGE OR NEGATIVE CHANGE	CONTINUOUS IMPROVEMENT RESULT ENHANCES LEAN CULTURE

Figure 3.17 Results Comparison

The Lean Performance methodology produces lean processes that deliver added customer value and can be measured and continuously improved. Lean Performance completes the journey begun by Total Quality: "Delivering customer value in everything a company does…not just through products and markets, but through Business Processes: the integration of functions, departments, and even suppliers, customers, and competitors into a company's strategy *in a continuously improving organization of Lean Processes*" (italics added; Adair, Charlene B., and Murray, Bruce A., *Breakthrough Process Redesign*, AMACOM, New York, 6, 1994) (see Figure 3.18).

Why is the Lean Performance methodology readily applicable to management decision processes? Well, if management decision processes were enabled by information technology, they would already be classified as information/support processes. As vendor-supplied standard software widens in scope, these processes *are* being enabled by information technology. The term "information/support process" will disappear as management decision processes are widely supported by information technology. Only decision and action processes will remain, and they will be information technology *enabled*, not information technology defined.

Process design will drive object-oriented computing when (and if) software objects replace software packages. In this scenario, the better the software object,

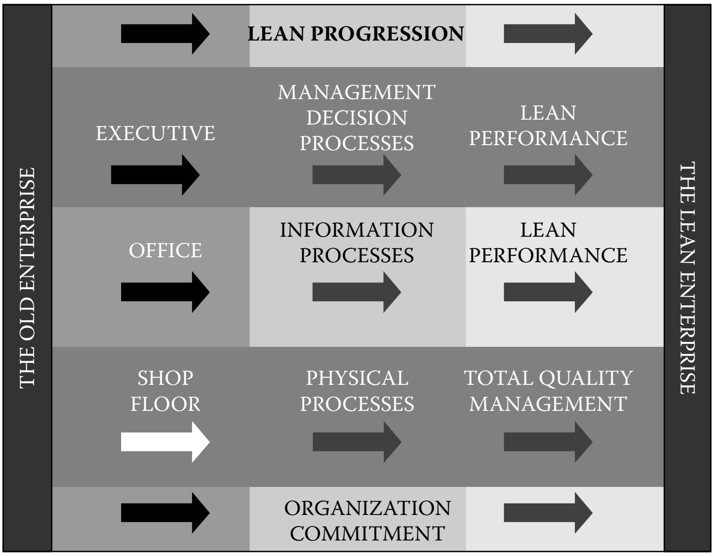

Figure 3.18 Lean Progression

the better the software functionality. The better the software functionality, the better the process is enabled. The better the process is enabled, the better the process. The better the process, the better the software object. Repeat as needed, as illustrated in Figure 3.19.

Building a new IT system before improving the management decision and information/support processes is like building a new production facility before improving the flow of the physical processes, in other words, you could end up with walls where you need doors. Lean Performance performs bottleneck engineering on management decision and information/support processes.

Lean Performance supports an overall strategy to attain a Virtual Lean Enterprise. It builds from the same attitudes and discipline as Lean Production, with management preparing the organization and demonstrating commitment. Lean Performance is also a growth strategy, just like Lean Production. Because nobody ever gets fired for improving their process, we'd better grow into our "leaned" capacity, utilizing resources freed up by lean improvements.

Finally, Lean Performance is necessary because management decision and information/support processes often are not value added, are not integrated with other processes or process data, and don't adequately support lean physical processes already continuously improving in the workplace. The output of Lean Performance is lean management decision and information/support management decision and physical processes because these processes:

- Deliver added customer value

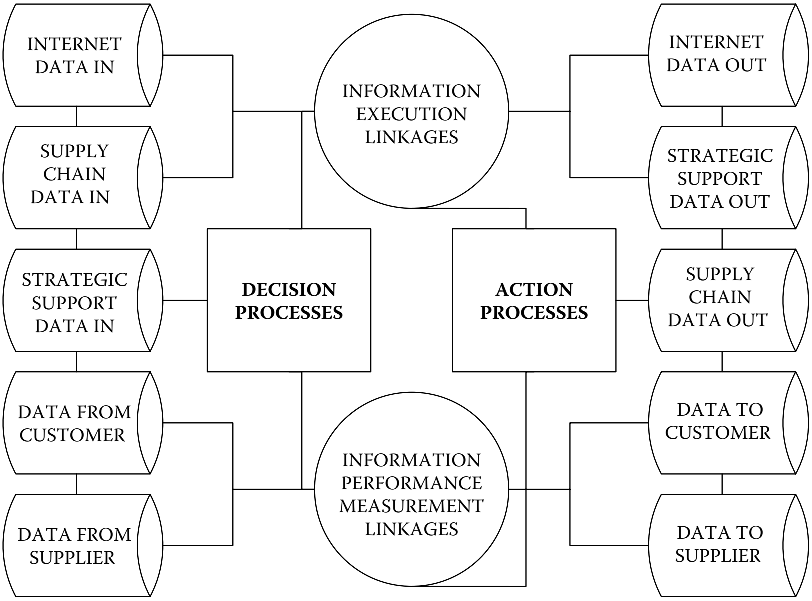

Figure 3.19 Future of Data Processing

- Have no waste remaining to eliminate (until next time)
- Can be measured and continuously improved

Following the Lean Performance methodology is necessary to provide the framework, initiative, culture change, and process focus prerequisite to transforming a manufacturing company into the continuously improving lean enterprise, continuously improving all enterprise processes in the context of a process structure we call Lean Commerce.

Chapter 4

Lean Cross-Enterprise Processes

What Is Lean Commerce?

Lean Commerce is the closed-loop IT-based business process model that supports manufacturing and service companies striving to reduce cycle time, flatten organizational layers, and "lean" processes. Lean Commerce is the business systems model that enables the Virtual Lean Enterprise by providing an overall design for the construction and use of the IT architectures for supply-chain management interchange of rapid communication of material requirements. Lean Commerce drives quick recognition and response by providing current supply and demand information wherever and whenever that information is needed throughout the chain of transactions and activities in the virtual and physical spaces that constitute the Virtual Lean Enterprise.

The accuracy and timeliness of information are measurable quality attributes. The turnaround time from data gathering or input until information is available is a key factor in determining the ability to respond quickly to customer requirements. Lean Commerce is designed to extend the quick response advantages of lean manufacturing forward through customer relationship management, and back through the entire material requirements and production scheduling and execution processes.

The key customer-oriented purpose of Lean Commerce is to understand and respond to customers' time-based demand expectations. The top priorities for time-based competition include processes where an improvement will be noticed and appreciated by customers. Important among these are customer relationship management and production scheduling processes. Highest on the list, however, is the shipping process. Getting a positive notice from your customer is always the case when you are able to ship *what* the customer wants, *when* the customer wants it. It's also nice to ship it *where* the customer wants it. The final test for lean implementation is to meet the customer order requirement, on time, every time, utilizing lean practices. The Lean Commerce model discussed here expands the opportunity to accomplish that objective by linking selling and distribution as a fully integrated part of the entire production system, providing accurate information to all processes in the lean supply chain. The Lean Commerce model also addresses the implications of Web retail, and the B2B markets, integrating information systems in the management of the lean supply chain.

Many emerging lean companies and their supply chains successfully employ a majority of the practices of Lean Production, but they are still being whipsawed by previously existing mass production thinking in their order entry, scheduling, and production processes, especially the information/support processes that depend on accurate customer demand data. Although many production facilities have become lean, the ERP-based planning and ordering processes of customers continue to be highly cyclical, including periods of classical mass production inventory build and drain. There are also rapid short-term shifts in the mix of products required, even when total demand is predictable.

We have learned the hard way that you can't produce to the plan. And, too often, you can't ship to the schedule. MRP–MRPII–ERP notwithstanding, the customer never "pulls" to the plan. And, our customer's customer doesn't either. As a consequence, the manufacturing processes are struggling with the ever-changing schedule, especially schedule and order changes within product cumulative leadtime. Until there is a fundamental shift in the approach to selling and distribution, one that incorporates a lean pull of customer order requirements planning, these cycles will remain and our planning and scheduling processes must accommodate them. Elements of "push" or "mass" production remain in the Lean Commerce model as the result of the continuing planning demand fluctuations and short order delivery requirements of many customers. This mass production "push" can be observed at several points in the model, wherever inventory is bought, manufactured, moved, or stored at an earlier time or in a larger quantity than is actually demanded (pulled) by the customer. Due to the need to manage these fluctuations, the Lean Commerce strategy is to use the characteristics of "Pull" where appropriate and to use the characteristics of "Push" where necessary. Prior to applying or developing applications in the planning, forecasting, and scheduling processes, companies striving to achieve a lean enterprise should consider the characteristics of Lean Production in their own manufacturing processes.

Developing information/support processes based on the lean commerce model supports the overall transition to Lean Production by servicing material and production schedules from the customer demand pull, while supporting production smoothing practices to assist in leveling production.

A primary characteristic of the Lean Commerce model is the pull of demand from the downstream process to the upstream supply process. A true Lean Production system is balanced so that no unneeded materials exist. A truly "lean" chain of supply would contain no unneeded materials in the chain. In many Lean Production environments, buffers exist in order to compensate for a lack of balanced flow between processes. Similarly, Lean Commerce depends on the identification of support buffers where needed but leaves them up to the production flow to determine.

In the context of production planning and scheduling, a perfectly lean system would be one in which customer demand pulls (via order and forecast) the system at a balanced rate, so that a flow of customer orders would replace the planning forecasts, with no significant unplanned fluctuations. To continue the production analogy, when an imbalance exists in a production process, either a queue of components waiting to be processed or an excess supply of component inventory will exist somewhere in the process to provide a steady production. It is these imbalances that we strive to eliminate through the continuous improvement process on the factory floor.

Correspondingly, when an imbalance exists in the planning and scheduling processes, an excess (or inadequate) supply of planned purchase or production orders will exist. These orders require continuous management and data manipulation. It is the balance of this planned order flow and the wasteful work and cost to juggle them that improves using the Lean Commerce approach.

Truly "lean" information/support processes of planning and scheduling would contain no unneeded manufacturing or supplier orders. In this context, successful management occurs in MRP II when supply is resolved with demand, aggregate planning is translated into detailed planning, and planning and execution are linked together via a two-way flow of information (the closed loop).

In seasonal markets, consideration must also be given to the classical production and inventory control practices of inventory build and drain. Unless an enterprise is willing (and able) to pay for the short-term capacity needed to service shipments in a seasonal consumption market (think Christmas sales), inventory will remain in any Lean Commerce model.

The Lean Commerce model supports the overall transition to the Virtual Lean Enterprise, while accommodating today's customer, who isn't always providing a lean order "pull." Requirements from existing mass production customers must be met today. As these customers become lean producers, with a correspondingly smoother and more balanced flow of delivery requirements, Lean Commerce will accommodate them by enabling a customer order/forecast (smoothed) pull on production and material requirements, with processes already in place to accommodate them in the Virtual Lean Enterprise flow. At the same time, customers who are already lean producers, who provide a stable flow of planning forecasts and who "pull" their deliveries "J-I-T," are also provided for in the Lean Commerce model. This is especially important during this era of global transition to Lean Production, because quality and delivery performance are the measurements that will ensure future orders from these customers. If you lose your lean customers, you'll be left with the remaining "mass producers" as your only customers, and they are looking more and more like endangered species in the (lean) global production base. And if they become extinct, so do you.

The organizational requirements of a lean manufacturing enterprise require lean process improvement within all process areas (i.e., marketing, production, etc.) and across process area functional boundaries. The organizational requirements of a Virtual Lean Enterprise require lean process improvements across enterprise boundaries. The Lean Commerce model that is being deployed by forward thinking companies to extend the use of lean practices across the supply chain is demonstrating that companies can work together in a "Virtual Lean Enterprise" if they all adopt lean principles and tools in developing and employing lean practices. Transforming to the lean enterprise in the e-commerce and e-business supply chains must not only include the aspects of Internet-driven customer relationship management, but it must do so in a lean model.

Lean Commerce processes span two or more organizational units (divisions, departments, sections, companies) but require process designs that reinforce lean principles and practices unfettered by organizational units. Lean Commerce requires changes in operating systems and organizational structures, including realignments of managers, staff, and workforce, and requires a new approach to external relationships (primarily suppliers and customers). Lean Commerce processes require explicit elimination of barriers to lean operations caused by organizational, departmental, corporate, divisional, and enterprise boundaries that interrupt workflow, including management decision making, information flow, and administrative "turf battles," waiting for authorization, bottlenecks, lack of feedback/feedforward, and communication.

The Lean Commerce model is based in lean principles, but with a clear recognition of the information technology systems development, and operations and financial considerations that must be made in the cross-functional and cross-enterprise process areas of customer relationship management, supply-chain management, and production and operations management. The model can be used with the capabilities of most elite ERP suites or as part of a strategy embracing the best of breed in CRM (customer relationship management) and APS (advanced production scheduling) applications, some of which have some elements of this functionality, although not until now presented in an integrated approach for deployment and with a team-based methodology for implementation. The Lean Commerce model can also include SCM, MES, CPFR, and collaborative demand software sets, if desirable.

Management decision support and executive information systems (EIS) can be incorporated in the Lean Commerce model, especially if those applications are employed in management decision processes such as business planning and sales and operations planning (S&OP), integrated to central ERP system data. Lean Commerce practices synchronize the entire Virtual Lean Enterprise, creating significant benefit and competitive advantage for all "virtual partners." The Lean Commerce model deployed through the Lean Performance methodology integrates lean process improvement with lean supply-chain integration, resulting in the emergence of the multi-enterprise Virtual Lean Enterprise.

Although level customer demand "pull" is not the norm, Internet-based customer relationship management processes are driving the transition to e-commerce and e-business. In the e-business economy, Virtual Lean Enterprise transformation is not possible without an Internet-based production smoothing approach that enables existing ERP technologies to be leveraged. In the absence of ERP supply-chain data, MUDA is generated in a vast amount to service the islands of separate data (noncentral data) and various island technologies (spreadsheets and independent database programs and applications) that are too often the new standard operating procedure in Lean Production implementations. The Lean Commerce/Virtual Lean Enterprise model is built to leverage existing ERP systems, which have come to dominate the essential processes in planning, forecasting, and scheduling, but Lean Commerce can be adapted to other or new software enablers as they are created and implemented. Some of these new enabling software sets are being developed and utilized by leading lean producers, including Toyota in North America. I will discuss the Toyota "Lean Commerce TPS" below. The Lean Performance methodology is focused on the implementation of a model designed to accomplish the enterprise transformation to Lean Commerce, and the Virtual Lean Enterprise, presented in Figure 4.1.

The foundation of the lean commerce model is Lean Production, a manufacturing system that has reduced throughput times and improved product quality in manufacturing environments all over the globe. In order to successfully use a Lean Production smoothing process, Lean Production processes must be in place and operating effectively. Lean Production processes are designed to operate on a pull basis, whereas most U.S. production planning systems are push systems (i.e., ERP, MRP, and production and inventory control systems with complex internal smoothing tools such as buffers, safety stocks, workstation queues, and in name only Just-in-Time systems).

The fundamental purpose of MRP II is to establish a process that links projected demand plans to supply plans in order to anticipate demand and to plan and schedule resources in a manner that supports a company's strategic and financial goals. In ERP architecture, the MPS is the primary tool available for production planning. Linking the MPS in a Lean Production smoothing process to the flow of customer demand data, including both orders and forecasts, will allow greater visibility and flexibility. These agreements can be utilized to drive the planning or longer lead-time buckets of the model. As newer forecasts and eventual actual

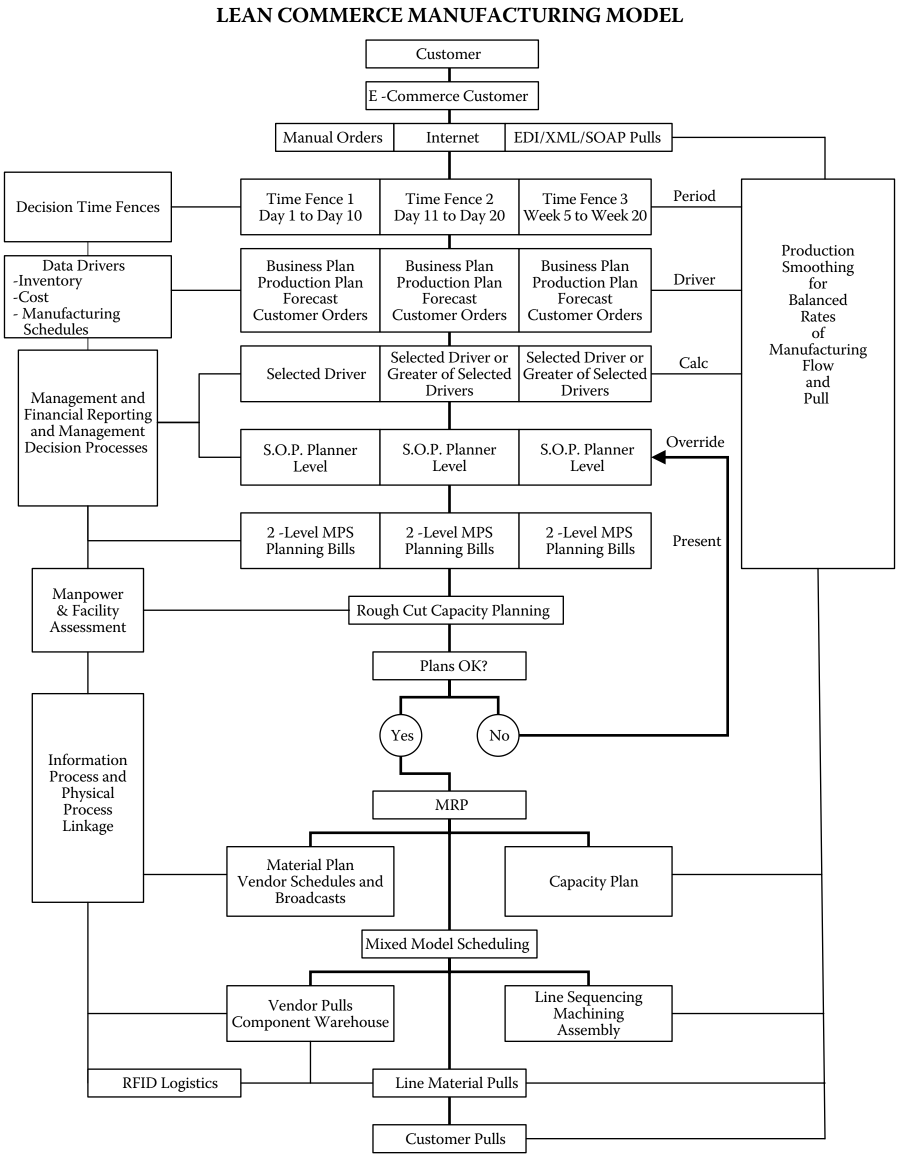

Figure 4.1 Lean Commerce Model Overview

orders are received, production schedules can be fluctuated up and down by product through mixed scheduling in response to daily requirements.

ERP/MRP systems do not require Lean Production processes. Most lean producers have experienced difficulty mating the mass production "push" basis of MRP with the "pull" mechanisms of lean. In fact, ERP/MRP systems can work more effectively in lean "pull" production environments than in mass production "push" environments because standardized production processes in Lean Production take the variability out of planning parameters (i.e., setup and run time) and compliance with quality specifications eliminate lot sizes and overruns that cover for scrap or rework. Production that is planned on process flow design complements the production input/output controls of MRP.

Lean commerce builds on the foundation of Lean Production by improving the linked information flow in the enterprise processes to include the direct (Internet, EDI, XML, SOAP, and manual) input of customer forecast and order data into the sales and operations planning (S&OP) and MPS processes. The lean commerce approach enables the use of that central data and shared information to present a dynamic flow of customer requirements to the entire Virtual Lean Enterprise, utilizing a single vendor suite of ERP applications, or a best-of-breed approach.

The Lean Commerce model allows open access to the S&OP results as well as to daily changes in customer requirements, with the ability to input MPS agreements into selectable "time-fence" periods to develop Customer TAKT and to facilitate capacity and material planning tools to develop Operational TAKT. By incorporating a production smoothing process in a system that considers fluctuating, lumpy, or seasonal demand, Lean Commerce facilitates a smooth material and production flow throughout the Virtual Lean Enterprise of product partners. Production smoothing also produces a part plan for parts whose production cycle, including suppliers, is longer than the order lead-time from the customer. Lean Commerce delivers the smoothed plan that supports the extraordinary flexibility of Lean Production to shift the mix of products manufactured, executed through the use of focused product-oriented manufacturing cells and a flow of production sequentially mixed (scheduled) to provide a smoothed demand on internal and supplier resources.

In Lean Commerce, rate-based demand and production planning leverage the existing MPS process to provide a flow, or Customer TAKT, of projected demand. By continuing the sales and operations planning (S&OP) management process performed today, an agreed-upon level of planned production can be established, and production/operations can adjust their cycle times by product to the Customer TAKT for that product or product family, producing an Operations TAKT that can be used to or build demonstrated capacity lower. Buffer requirements can also be calculated by MRP and benefit the production of seasonal or "lumpy" demand being smoothed by the Lean Commerce calculations. Creating a seamless handoff from the existing S&OP process to the Lean Production smoothing process, with information delivered Just-in-Time, can be accomplished with Lean Commerce.

Lean Commerce is a capable operating system that incorporates data integrity. That is not to say that Lean Commerce "automates" a successful S&OP (sales and operations planning) and follow processes. Lean Commerce encourages but does not by itself generate reliable forecasts. It is still the responsibility of management to manage. One of the critical management tasks that must be accomplished is a correlation between the sales forecast as it is input to the planning process and collaboration with customers to jointly review projected demand and to understand customer needs. It is paramount to distinguish between what the customer actually wants and what the company wants to think the customer wants. Gathering accurate market data is the first step in producing a usable forecast. Sending accurate data, once collected, to the planning process is also critical. A "wish" forecast isn't helpful. Although some forecast projections may not be what the Board of Directors wants to hear, better data makes for better forecasts and better planning. Knowledge that a product is fading in the market, or a market is not developing as one would like, can provide direction to new product development and introduction to maintain financial performance, rather than suffer the sales declines otherwise indicated.

Lean Customer Relationship Management

Mass production led to mass marketing and the decline of the importance of individual customers. This has been partially recognized in the many belated attempts at customer service initiatives and, more recently, customer relationship management (CRM). Because primary Lean Production objectives include customer focus, with market-driven products and improved customer service paramount, the shift to Internet-based customer relationship processes is very appealing in the Virtual Lean Enterprise.

Information about customer requirements must be consistently updated throughout all planning and scheduling processes. The aggressive selling system employed by Toyota in the TPS in Japan (obtaining orders directly from the customer and pulling production with them) made the success of *heijunka* (production smoothing) possible.

In the early years of the 21st century, "buzz" and "hype" surrounded the emerging "point and click" possibilities of Internet-based customer order management, or CRM. A lot of dotcoms learned that "point and click" is useless without "pack and ship." Click and mortar is the successful model. But even the mortar isn't enough when it doesn't contain the inventory that the customer has ordered. The latest lesson in e-commerce is that the emerging virtual supply chains that support new Internet-based customer relationship management must be linked to enable the production of the right goods, at the right time, to support the impatient e-customer.

The primary objective of lean customer relationship management is to maximize revenues from a customer over the long term, not from the market in the short run. In the lean enterprise, ever-changing customer requirements information must be available to all process owners, operators, and customers who are affected by it, including suppliers. Production smoothing keeps the total volume of production as constant as possible. In turn, the volume of business to suppliers is steady. Short-notice order changes are rare. The lean customer relationship management process forms the front end of a Lean Production system that is pulled by the requirements

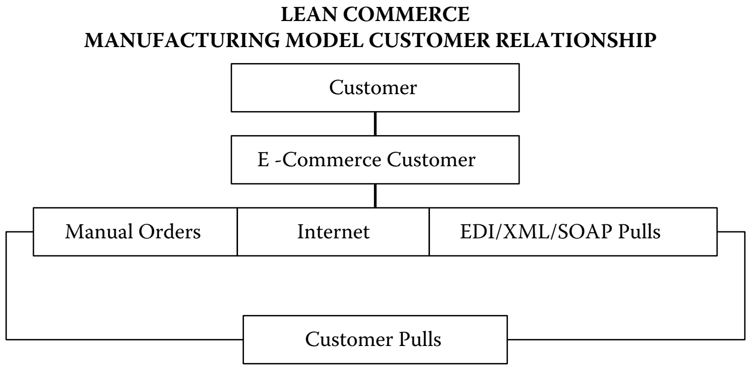

Figure 4.2 Lean Commerce Model—Customer Relationship Level

of the customer and still enables the factory to operate with less inventory, higher quality, lower costs, and quicker response to the customer.

A lean customer relationship management process interface with production must include the ability to manage contact with the customer before, during, and after the product is booked and shipped. Lean customer relationship management must collect data on customer needs and preferences on a continuous order-driven basis and feed it back into the new product development process to identify market trends directly. It must also include mass customization order processing to meet individual customer order requirements.

Lean customer relationship management processes empower intensively trained personnel, with multiskilled teams versed in all aspects of sales product knowledge, order processing, and customer profiling (i.e., one-stop [person] selling); product specialists, not professional salespeople; team cooperation versus individual competition; and standardized pricing versus negotiation. A lean customer relationship management process is based on the pull of customer orders (not production to stock), minimal distribution channel inventory, and a short delivery cycle (i.e., as little as 4 days at Toyota for a Corolla compared to 6 to 12 weeks for U.S. assemblers).

As illustrated in Figure 4.2, the Lean Commerce system is driven entirely by customer requirements and is delivered via EDI, XML, and SOAP order sets; by EDI, XML, and SOAP release or planned order sets; and via manual order entry, necessary for orders or plans received by fax, snail mail, phone, or otherwise. Customer requirements are loaded into the planning or "push" cycle at the top of the model and are used to provide the "pull" to the manufacturing processes at the bottom of the model. These customer requirements are obtained from a variety of sources and are perhaps managed by a variety of system enablers in most IT environments.

As illustrated in Figure 4.2, customer requirements are key to the realistic flow of demand requirements and subsequent production flow. Also critical are the early intervention capabilities of the "available to promise inquiry," illustrated in Figure 4.3. "Available to promise" is a time-honored system tool that facilitates the demand planner in smoothing the initial entry of order demand. A customer order "consumes" planned production within already agreed-upon and established Operational TAKT. The demand planner quickly sees overload, or available underload, and can work with the customer to shift the plan accordingly. The production smoothing process that is possible with Lean Commerce follows. Rather than continuously manipulate the planned, firm planned, and released orders in the typical system, what I propose is that the mechanics of MRP, driven by the push of customer orders, forecasts, and internal S&OP demand smoothing, be allowed to function as designed by the MPS/MRP originators. Our "available to promise inquiry" has all the critical data needed to book an order into the schedule, not be disruptive to the schedule.

Lean Production Smoothing

The three elements of Lean Production smoothing are: customer requirements demand pull Customer TAKT determination; rate-based Operations TAKT determination; and mixed-model production scheduling. These work to support and in turn are supported by the other Lean Production practices to improve the volume and pacing characteristics of Lean Production.

During the evolution to MRP II and ERP, the processes of forecasting, business and production planning, and (later) S&OP were improved to include regular meetings, usually monthly, of senior managers from all functions of the company. The S&OP team makes decisions on how to allocate resources when projected demand and supply plans are out of balance, resolve any other issues (holiday or shutdown planning, etc.), and agree on a single operating plan. The S&OP process is utilized in many Lean Production environments to update the company's operating plan, projecting future demand and analyzing the company's resources and capacity. In the lean enterprise, S&OP is the planning tool that balances supply and demand across the future planning horizon and enables effective decision analysis at the aggregate level, while providing a "benchmark" for detail decisions about product families and eventually product SKUs. In a well-operated S&OP process, top management is engaged in the key process necessary to manage the enterprise, making the critical decisions necessary to integrate operating plans to the financial forward-planning processes. Key to planning for production in the lean commerce business model is that the S&OP/*heijunka* production smoothing processes are the basis for three elements of pacing: Customer TAKT, Operational TAKT, and engineered cycle time, also referred to as demonstrated capacity. Key to delivering product in a lean flow in the Lean Commerce model are three elements of production flow. The first is balanced production, in which all operations or cells produce at the same engineered cycle time, which is less than or equal to Operational TAKT. The sec-

AVAILABLE TO PROMISE INQUIRY

CURRENT ON-HAND 600
PAST DUE DEMAND 0
PAST DUE RECEIPTS 0

CURRENT ATP 0
FIRST ATP DATE 03-16-07
FIRST ATP AMOUNT 200

Part # 12-33789-01

		DEMAND			RECEIPTS			
FROM	TO	FORECAST	PLANNED	FIRM	MPS	SCHEDULE	INVENTORY	ATP
02-26-07	03-04-07	1200		200			400	0
03-05-07	03-11-07	1200		500			−100	0
03-12-07	03-18-07	1200		1500	5000	5000	3400	0
03-19-07	03-25-07	1200		500			2900	0
03-26-07	04-01-07	1200		2400			500	0
04-02-07	04-08-07	1200		500			0	0
04-09-07	04-15-07	1200		3700	5000	5000	1300	200
04-16-07	04-22-07	1200		600			700	200
04-23-07	04-29-07	1200		300			400	200
04-30-07	05-06-07	1300		200			200	200
05-07-07	05-13-07	1300		3500	5000	5000	1700	1100
05-14-07	05-20-07	1300		600			1100	1100
05-21-07	05-27-07	1400					1100	1100
05-28-07	06-03-07	1400					1100	1100
06-04-07	06-10-07	1400			5000	5000	6100	6100
06-11-07	06-17-07	1400						
06-18-07	06-24-07	1400						
06-25-07	07-01-07	1400						
07-02-07	07-08-07	1400						
07-09-07	07-15-07	1400						

DEMAND DETAIL	RECEIPT DETAIL	SUBSTITUTION INQUIRY	ATP VS. PLANNED	ATP VS. FORECAST	MAINTAIN MPS	GO TO DATE	ROLL FORWARD	ROLL BACK	RETURN TO ORIGIN

Figure 4.3 Available to Promise Inquiry

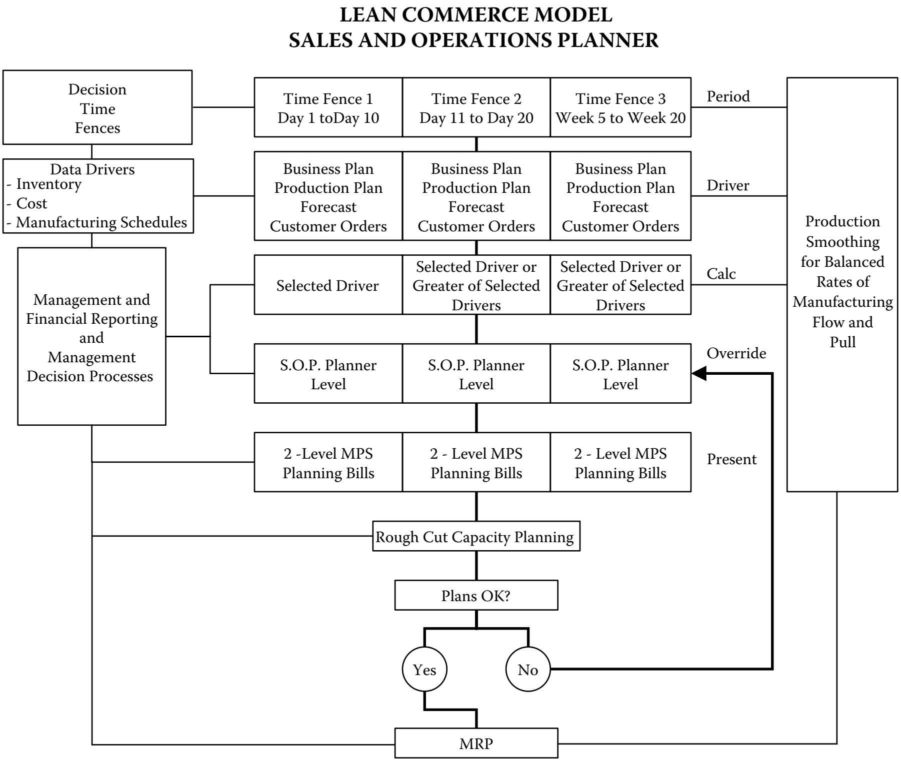

Figure 4.4 Lean Commerce Model—Sales and Operations Planner Level

ond is that these operations and cells are in a balanced plant, where the capabilities of resources are balanced to Customer TAKT to produce an Operational TAKT that can produce at least the Customer TAKT quantity. The third is that the lean commerce business model employs a pacemaker process, which is any process along the product process stream that sets the pace for the entire stream. The pacemaker process is not the constraint or bottleneck process: these operations or cell processes should be balanced, not relied on to pace. The pacemaker process is usually near the customer contact to the process stream, where the customer pull is received. The pacemaker process is often the final assembly cell. See Figure 4.4 for an illustration of the Sales and Operations Planner Level of Lean Commerce.

The issue of TAKT time is perhaps the greatest point of dissent between the "techies" and the "leanies." A few definitions are in order so that a common baseline can be established between the two camps on the central question of TAKT: what it is, how we arrive at it, and what we do with it. TAKT time has several elements, each distinct and important to the effective use of TAKT to manage production. As stated above, TAKT-based planning and execution includes three primary elements of smoothed production planning built over the foundation of

SOP PLANNER SCREEN

PART # 12-33789-01								
FROM	BACKLOG	02-26-07	02-27-07	02-28-07	03-01-07	03-02-07	03-05-07	03-06-07
TO		02-26-07	02-27-07	02-28-07	03-01-07	03-02-07	03-05-07	03-06-07
BUSINESS PLAN		600	600	600	600	600	3000	3000
FORECAST		1500	1500	1500	1500	1500	7500	7500
PLANNED ORDERS		1400	1400	1400	1400	1400	7000	7000
FIRM ORDERS		0	0	0	0	7500	7500	7500
SUGGESTED MPS		0	0	0	0	0	0	0
MASTER SCHEDULE		4800	10000	10000	10000	0	0	0
INVENTORY	1000	5800	15800	25800	35800	28300	20800	13300
DAYS ON HAND @ C/TAKT	0.03	0.19	0.53	0.86	1.19	0.94	0.92	0.89
PART # 12-33789-02								
	BACKLOG	02-26-07	02-27-07	02-28-07	03-01-07	03-02-07	03-05-07	03-06-07
FROM		02-26-07	02-27-07	02-28-07	03-01-07	03-02-07	03-05-07	03-06-07
TO		13000	13000	13000	13000	13000	65000	65000
BUSINESS PLAN		16000	16000	16000	16000	16000	80000	80000
FORECAST		16000	16000	16000	16000	16000	75000	75000
PLANNED ORDERS		28000	0	28000	0	28000	56000	0
FIRM ORDERS		0	0	0	0	0	0	0
SUGGESTED MPS		0	0	0	9500	19000	95000	95000
MASTER SCHEDULE	740000	46000	46000	18000	27500	18500	38500	53500
INVENTORY	0.53	0.41	0.41	0.21	0.33	0.29	0.38	0.46
DAYS ON HAND @ C/TAKT								
AZ PRODUCT LINE TOTAL								
FROM	BACKLOG	02-26-07	02-27-07	02-28-07	03-01-07	03-02-07	03-05-07	03-06-07
TO		02-26-07	02-27-07	02-28-07	03-01-07	03-02-07	03-05-07	03-06-07
BUSINESS PLAN		38000	38000	38000	38000	38000	190000	190000
FORECAST		40000	40000	40000	40000	40000	200000	200000
PLANNED ORDERS		37500	37500	37500	37500	37500	187500	187500
FIRM ORDERS		41000	40000	45000	39000	35000	200000	200000
SUGGESTED MPS		0	0	0	0	0	0	0
TOTAL PRODUCTION		39000	39000	39000	39000	39000	195000	195000
DAILY PRODUCTION		39000	39000	39000	39000	39000	39000	39000
INVENTORY	29100	289000	288000	282000	282000	286000	281000	276000
DAYS ON HAND @C/TAKT	0.35	0.34	0.34	0.30	0.30	0.33	0.30	0.28

CHANGE TIME BUCKETS	SIMULATE MPS	MATERIAL AVAILABILITY	MPS INQUIRY	DISPLAY MPS ONLY	DISPLAY CUM TO DATE	ROLL FORWARD (PARTS)	ROLL BACK (PARTS)	ROLL FORWARD (TIME)	ROLL BACK (TIME)

Figure 4.5 SOP Planner Screen

three primary elements of balanced production execution. A final execution practice makes the system flow as customer requirements are met.

The first element of production smoothing (*heijunka*) is *Customer TAKT,* which is the frequency of customer demand and ultimately the frequency at which a product must be produced by the final physical process in order to meet that demand. If it hasn't been said often enough, there would be no need for production smoothing if the customer demand were to be rock-steady at a fixed quantity of demand for each period of execution. Alas, that is not and will not be the case, unless of course the planned economy ever takes root, and production and consumption are dictated by higher authority. Anyone who is familiar with the rise and fall of the planned economy of communism does not expect that to occur. In the S&OP in Lean Commerce, Customer TAKT is calculated from the sales forecast and customer orders, incorporating and allowing for adjustments that are inserted into the calculations through business plans, production plans, and the S&OP agreements themselves. Figure 4.5, showing the S&OP planner screen, illustrates how the data streaming into the production smoothing process is presented to the S&OP planner, where that data can be adjusted, and other data inserted by the S&OP planner.

These insertions include consideration for build and drain, seasonality, and other lumpy demand such as intermittent demand shifts, inventory adjustments for promotions and phase-outs, as well as planning for holidays and plant or facility shutdown periods.

In some cases, it is more accurate to say that, because Lean Commerce uses time fences in the demand calculations, the SOP planner screen displays the Customer TAKT *per time fence.* This figure represents the number of units that must be produced in order to meet the demand for that period and also be in an in-stock position sufficient to meet the Customer rate of demand in the following period without increasing or decreasing the Customer TAKT more than an agreed-upon percentage that can be accommodated by the Operations TAKT and engineered cycle time.

Customer TAKT per time fence is the demand pull rate determined by the SOP planner, as daily or more frequent review is performed of the key planning data displayed on the single SOP planner screen. Using the language of demand and supply, Customer TAKT is the demand for capacity, and Operational TAKT time is the supply of capacity and also the rate of production required to meet Customer TAKT. The Operational TAKT calculation is *operating time* divided by *quantity required*. For example, if customers require 240 items per day and the plant operates 480 minutes per day, Operational TAKT is 120 seconds. If the Customer TAKT for grommets is 240 grommets per day, and the grommet line operates 480 minutes per day, Operational TAKT is 2 minutes. To meet customer demand, sufficient resources, both in people and equipment, must be available to produce one unit every 120 seconds. The finishing operation for grommets needs an output rate, or *engineered cycle time*, of 120 seconds or less. Operational TAKT is the demand for capacity whereas engineered cycle time represents the supply of capacity. Engineered cycle time is the proven output rate from the cell or line or other resource involved. So, the simple proposition of Lean Commerce is this—Customer TAKT balanced to Operational TAKT balanced to engineered cycle time, running in a balanced work cell facility paced by a final assembly process that receives the signal to build via a customer "pull." The customer "pull" is either an actual customer order for immediate shipment or a stocking order for build of seasonal or otherwise lumpy demand considerations and coverage. Lean Commerce is all calculations and decision support available to both the SOP planners as well as the entire staff involved in the lean ERP processes, as well as the mixed-model and final assembly scheduling processes. Therefore, everyone is on the same page, with the same data, for the same objective. The SOP planner screen calculates Customer TAKT well into the future and displays this value on the screen. Whether business is increasing or decreasing, operations personnel can see future workload for months out into the future and concentrate on developing increased or decreased engineered cycle times (demonstrated capacity) to meet the increases or decreases in demand.

The SOP planner screen is the *dashboard* for producing a smoothed master production schedule (MPS). The MPS then flows into the MRP calculation to produce the detailed material requirements plan (MRP). The SOP planner screen displays all key planning parameters on a single screen, including customer demand (firm shipping orders, planning orders, and forecast separately displayed), business plan for the part, current master schedule, and the planned inventory in both units and average days of customer coverage on-hand. Whether planning at the product level or product family level, the screen displays the product family totals at the bottom of the screen so the planner can review the proposed MPS relative to the total Operational TAKT previously established. Planning at the product family level is usually accomplished by using planning or two-level planning bills, and the Lean Commerce model and SOP planner screen support this approach. In a planning bill, the common components in the family are structured on the planning bill along with each of the unique components. The modular structure of the planning bills allows over-planning of the unique components, which enables minimal buffer stocks to cover instances of finished demand variation. Utilizing this planning bill approach enables buffer coverage to be proportional to and time-phased with Customer TAKT, unlike safety stock or buffer stock at the finished good level, which is fixed and not drawn up or down as demand fluctuates.

Planning is performed in master production time-fence periods, with variable lengths for products and product families established in the part item masters so planning can be performed by part or family in daily or weekly time-fence periods in the near term and in weekly and monthly time-fence periods in the future time-fence periods. The Lean Commerce model uses time fences in the MPS, where a time fence is equal to a certain period of time that corresponds to a certain (selectable) demand source rule that will determine the demand accumulated to drive the demand input to the calculation.

A key consideration in the use of time fences is the separation of planning time fences from scheduling time fences. Planning involves putting in place the right level of resources, while scheduling does the optimum with the resources available now, with timely information about continually changing customer requirements available when and where it is needed to make decisions. The planning time fence is essentially a "push" driver to the manufacturing supply chain and to the manufacturing processes. It has larger time buckets, a longer horizon, and deals with products on an aggregate, usually family, basis. The scheduling time fence has daily time buckets, a short time horizon, and deals with finite products and resources. The order time fence is daily and immediate.

Time fences can also be viewed as rules that govern changes to the MPS. Beginning far in the future, beyond the cumulative lead-time of the parts being planned, requirements resemble a solid stream of fluid and difficult-to-differentiate forecasts and planned orders. At the far horizon, it is relatively easy to make planning changes at the product and product family levels.

Planning decisions become increasingly restrictive as the time of supply-chain production "pull" approaches. Within the cumulative lead-time boundaries, planners can and do make decisions and trade-offs that are reflective of capacity and material realities. The nearer to lead-time the customer changes demand, the more difficult it is to accommodate. As noted above, buffers and safety stocks have been planned by MPS/MRP processes in order to manage these fluctuations, but often proponents of pure lean advocate for "zero" buffer. This is a tricky proposition and is not to be embarked upon lightly. It is better to work down the buffers and safety stocks as lean transformation goes forward than to paralyze customers, suppliers, and operations with hard turns toward pure J-I-T before the operations are ready, or in cases where market and customer demand fluctuations simply won't allow this.

Operating with a "frozen period" is desirable but not always possible. The "front" or short time fence can be used to denote the frozen period, which should be a short-order activity period, perhaps equal to the final assembly/ship lead-time. If the frozen time fence is longer than the assembly/ship lead-time, it will cause frequent disruptions, reschedules, and expedites to accommodate customer (and management) last-minute inserts and changes. Short product lead-time, demand pulled production, and flexible lean mixed-model scheduling all work against a long frozen time fence. In an enterprise where throughput time is in minutes, the need for frozen periods is also in minutes.

The Lean Commerce model requires demand source rules that are selectable (hierarchical) at the system, product family, or part level and that allow selection of input from a variety of sources and levels of input, with only one input source per period, defined in the production smoothing process. The Lean Commerce model requires, for mixed-model scheduling, a calculation driver "T," where "T" is equal to a period of time that is selectable (hierarchical) at the system, product family, production line, or part level, and that represents the length of time over which customer orders are to be considered as the demand driver to the calculation. What results from these calculations is the Customer TAKT as presented to the lean producer by their customers, over time and across time fences. Toyota in North America utilizes a variation of this model today.

Loading and smoothing the demand data on a daily or more frequent basis provides an invaluable resource to the entire lean chain. The planned order output shows all eligible viewers exactly what we think is going to happen, based on all best available data and input, smoothed through our best flow calculations. The order pull from the customer that is fed to the pull point at the shipping location is the trigger for all square, signaling, two-bin or kanban lean visual management in the factory. The demand data, smoothed through the S&OP and MPS processes, and calculated by MRP, is also available for APS or line scheduling and balancing, with local Operational TAKT calculation. The flow of manufacturing orders that constitutes the major maintenance burden in most manufacturing systems is basically ignored, other than to use order records to flush inventory. The same order records, as I describe them below, can be used to generate kanban tickets, if desired, at BOM stocking points (although I prefer to call these BOM "release" points). By utilizing MRP generation to produce the e-kanbans, safety or "buffer" stock lot

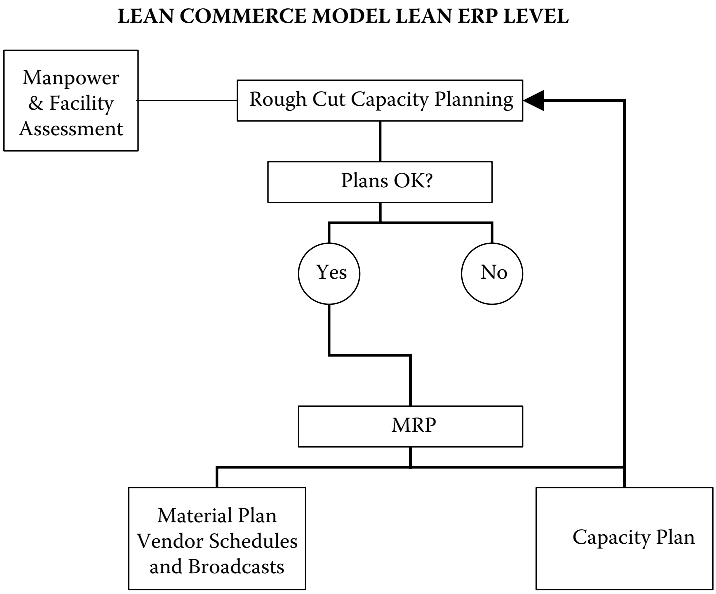

Figure 4.6 Lean Commerce Model—Lean ERP Level

quantities or calculations can be utilized in order to provide the "smoothing" of safety, or buffer, quantities in a lumpy demand flow.

Used in conjunction with the time fence and demand source capabilities of most ERP-based MPS modules, the Lean Production smoothing process is customer focused, which helps align MPS planning orders and the (eventual) customer-pulled production requirements. The consumption rates developed through the Lean Production smoothing process provide supply-chain forecasts and schedules that are also more aligned with customer requirements pulled through the system. Rate-based planning aligns upstream component schedules also. Smoothness in the MPS improves the downstream component, supplier, and assembly processes, making them easier to manage and execute. As illustrated in Figure 4.6, Rough Cut Capacity Planning is available to review the plan prior to MRP execution.

Working further downstream, the MRP module of existing ERP software packages is used to develop production and supplier schedules, with mixed-model scheduling utilized to balance or smooth the final assembly schedule and upstream production flow.

The primary ERP assumption of the Lean Commerce model is "You *can't* get a makeable schedule from an ERP system, but you *can* get a pull-able plan." A makeable schedule is a schedule that contains all the customer order requirements for the period, as well as the production sequence supported by capacity and material availability to produce the customer requirements on schedule. They are so rare that sightings are almost never reported, and when reported they are usually discovered to be in error. Lean Commerce delivers a "this moment" makeable schedule to virtual enterprise partners and facilitates the kanban and visual adjustments to plan that commence as soon as the customer makes a change. Other drivers of adjustment to schedule include supplier failure or mistake, machine breakdown, and operator absence. A "pull" production environment with visual production control works to manage the fluctuations of shop floor control far better than an MRP-produced schedule that is wrong before it hits the floor.

At the Lean ERP level, a supplier plan is developed that is "broadcast" to enterprise suppliers to provide demand forecast and order information. As simple as this seems, all the virtual partners utilize supplier broadcast to "load" current and future requirements data across the virtual lean enterprise, daily or more frequently. The simple fact of the demand data driving the planning and execution, within lead-time, of the components consumed in the end-products of the virtual "chain" creates tremendous synergy of supply and demand, with each partner reacting to requirements as its Operational TAKT and engineered cycle prowess will allow. Although all demand requirements are presented for planning, suppliers deliver only when pulled by the consuming partner. When the MPS/MRP plan runs again, all partners are back in sync, and the process of planning and meeting partner requirements begins again.

After the SOP planner completes smoothing the MPS, MRP generates the recommended schedule and sequence for components and subassemblies. With the MPS process ensuring that all customer orders and forecasts are able to be fulfilled, the component and subassembly scheduling process is designed to sequence production efficiently and to prioritize production while maintaining the agreed-upon Operational TAKT. Figure 4.7 shows the assembly scheduling screen that enables orders to be arranged into the appropriate efficient sequence for the day's production.

Finally, mixed-model scheduling (smoothing) of the production sequence enables flexible balancing of the demand flow manufacturing processes and ensures a level demand-pull across component lines and through the supply chain. Mixed-model scheduling techniques are supported to allow line and shift prioritizing of production considering actual customer pull requirements and buffer component and finished good inventories. Product rotation and changeover based on production efficiencies is supported, and common information about requirements is present at both the planning and scheduling levels of the model. Planned component availability is utilized to enable J-I-T-triggered pull kanban practices to "pull" supply into production processes. Figure 4.8 illustrates the Factory Flow level of Lean Commerce.

The final assembly screen shown in Figure 4.9 provides simultaneous visibility of multiple assembly lines for a given day. This screen also provides a link to the MPS inquiry screen to allow for visible customer demand at all levels of planning and scheduling. Maintenance of MRP orders is abolished, with requirements slotted by line and part/quantity, and reporting is limited to backflushing of consumed inventories against completed customer shipments.

ASSEMBLY SCHEDULING SCREEN

PLANT	LINE	DATE	SHIFT
1	2	02-26-07	2

SEQUENCE	ORDER #	PRODUCT	CUSTOMER	QUANTITY TO BUILD	COMPLETED
1	4278	0402746973	MACK	24	
2	4269	0402076770	NAVISTAR	16	
3	4271	0402076767	DEERE	18	
4	4279	0402776811	DEERE	16	
5	4270	0402076773	NAVISTAR	10	
6	4277	0402746972	MACK	40	
7	4272	0402736837	CDC	24	
8	4273	0402736840	CDC	32	
9	4280	0402736844	CDC	24	
10	4274	0402736842	CDC	56	
11	4275	0402736843	CDC	24	
12	4268	0402046860	NAVISTAR	40	

CHANGE TIME BUCKETS	SIMULATE MPS	MATERIAL AVAILABILITY	MPS INQUIRY	DISPLAY MPS ONLY	DISPLAY CUM TO DATE	ROLL FORWARD (PARTS)	ROLL BACK (PARTS)	ROLL FORWARD (TIME)	ROLL BACK (TIME)

Figure 4.7 Assembly Scheduling Screen

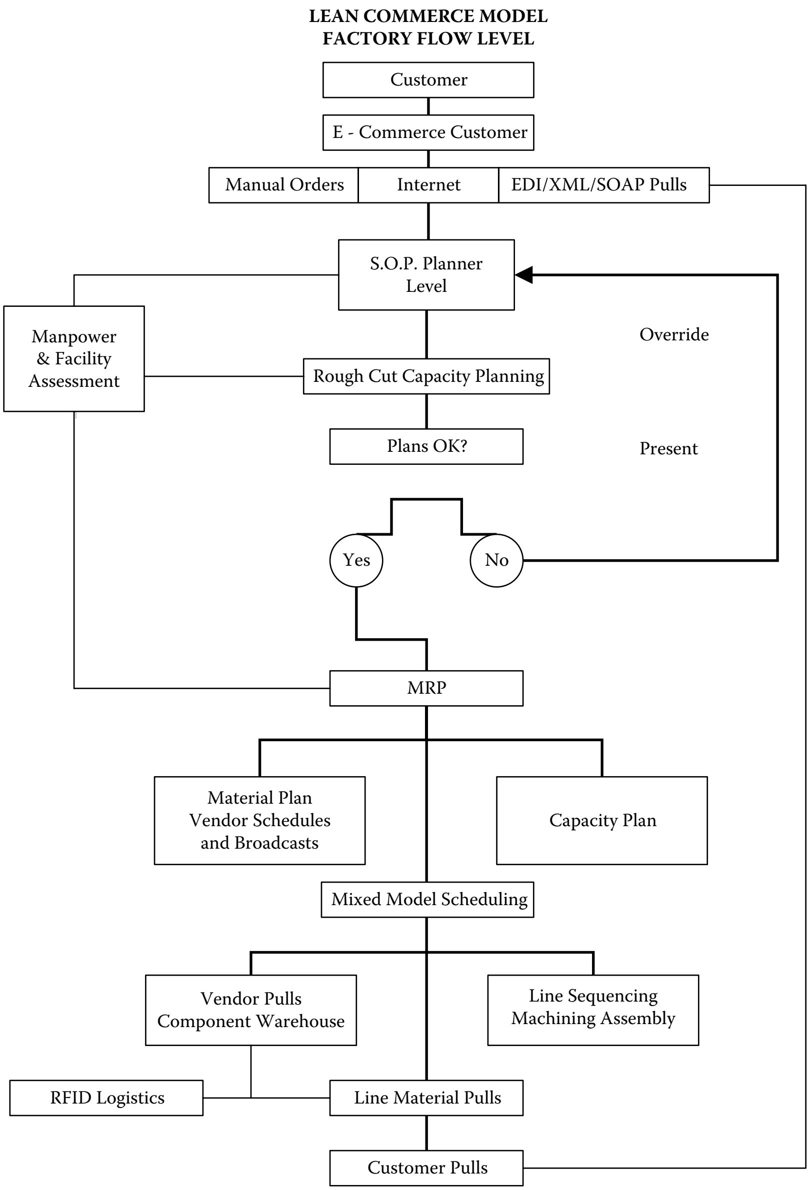

Figure 4.8 Lean Commerce Model—Factory Flow Level

Lean Supply-Chain Management

In the supply-chain management model, suppliers are viewed as forming a chain of linked processes. The concept is derived from the need for each producer in the chain to have its lower-tier supplier provide process inputs at the right time, in the

FINAL ASSEMBLY SCHEDULING SCREEN

PLANT	DATE	SHIFT
1	02-26-07	ALL

	LINE A		LINE B		LINE C		
DAY	QTY	PRODUCT	QTY	PRODUCT	QTY	PRODUCT	TOTAL
02-26	5700	0280150934	10000	0280150948	18500	0280150942	
02-26	4800	0280150766					39000
02-27	10000	0280150766	10000	0280150948	19000	0280150942	39000
02-28	10000	0280150766	10000	0280150948	19000	0280150942	39000
03-01					9500	0280150942	
03-01	10000	0280150766	10000	0280150948	9500	0280150944	39000
03-02	10000	0280150931	10000	0280150942	19000	0280150944	39000
03-05	10000	0280150931	10000	0280150942	19000	0280150944	39000
03-06	10000	0280150931	10000	0280150942	19000	0280150944	39000
03-07	6400	0280150931	10000	0280150942	19000	0280150944	
03-07	3600	0280150942					39000
03-08	10000	0280150942	10000	0280150942	19000	0280150944	39000
03-09	10000	0280150942	10000	0280150942	19000	0280150944	39000

INSERT	MPS INQUIRY	MATERIAL AVAILABILITY	DDL INQUIRY	DISPLAY 1 SHIFT ONLY	REPORT PROD AND SCRAP	ROLL FORWARD	ROLL BACK	ROLL FORWARD (TIME)	ROLL BACK (TIME)

Figure 4.9 Final Assembly Screen

right quantity, and to the right quality. If this is not done throughout the chain, the supplier delivering to the last "link" (i.e., original customer) cannot meet the final producer requirement.

Pioneering lean manufacturers have demonstrated that the key to a competitive supply chain is found in the way shippers work in cooperation with their suppliers. Shifting the burden (and cost) of inventory down the supply chain has often been the driver behind sourcing of components with more frequent (J-I-T) deliveries. Suppliers are expected to maintain the capability to deliver, no matter how the schedule fluctuates. Inventory is used to buffer the inaccurate schedules. However, shifting the burden (and cost) of inventory down the supply chain does nothing to improve the performance of the chain, and the lean enterprise is nothing more than a lean supply chain. Lean Commerce processes extend the lean supply chain into the Virtual Lean Enterprise.

In the Virtual Lean Enterprise, a supplier–customer relationship is viewed as a set of reciprocal obligations, based on a commitment to lean principles and practices. At the top of the chain, producer obligations include a feasible production schedule, with level loading and a balanced flow of production. Producers often assist with suppliers' lean transformation and offer a stable relationship as an incentive, often hinged on a quality certification program.

Supplier obligations include maintaining capacity to meet expected demand and on-time delivery, while sharing continuous improvement benefits. Lean producers expect their partners, virtual or otherwise, to operate in a pull-based production process in compliance with the customer's quality requirements.

Lean supply-chain management relies on long-term cooperative vendor relationships, not on a set of adversarial relationships among several suppliers or multiple suppliers, each with a small slice of the required order. Lean supply-chain management utilizes the purchasing department as a team member in the new product introduction process, and as a contributor to continuous improvement with new materials, services, equipment, and product ideas. Lean supply-chain management utilizes multiple vendor selection criteria, not just cost. These include the willingness to partner, sharing cost information, commitment to lean practices, and continuous price reduction targets over the life of a part.

In the lean supply chain, suppliers are expected to deliver according to lean practices, utilizing a pull-driven, continuous flow of incoming materials, with quality certified goods delivered to J-I-T scheduling. There are no supplier-required inventories upon delivery; instead, delivery lot sizes are based on customer specifications. Linking through the application of the Lean Commerce model allows partners to view each other's flow, and anticipate demand, with delivery occurring only on receipt of kanban card or e-kanban.

Lean Performance China Strategy

Although transferring product manufacturing offshore is not the subject of this book, it is appropriate to include a discussion on the phenomenon of offshoring in an ERP implementation project management book for one reason: the ERP project manager must be involved in any current or projected offshoring process undertaken by the enterprise. Should the ERP project manager come into an already completed offshoring activity, there is still a need to ensure that new ERP process support is extended offshore in the current implementation. With those considerations in mind, here is an analysis of the offshoring activity and support needed from the ERP implementation. Here are a few issues to consider:

- What if a major fire or other catastrophe occurs in our Chinese facilities?
- Will we be protected in terms of product flow if we lose our supply from China?
- Especially for R&D intensive products, coordinating the process stream of market research—product development—product manufacture—first piece acceptance is more difficult the further production is from the customer. Is this the case for our products? How will we accomplish these processes in our new ERP system?
- Can the product development and engineering processes be outsourced for our product(s)? If not, can these processes be made to flow so that time to market is not significantly impacted?
- How long will it take to get product from our new operations? Unfortunately, experience shows that it can take two to three times the expected timeline before product is available. And products won't be selling in the new market until then, either. By the way, current U.S. base of supply or manufacture will remain in operation in some form until the last product is outsourced. Remember this as a cost addition in projections and payback analysis.
- What would be the cost of safety stocks to cover delays in the scheduled versus actual start-up of shippable production? Include products not being transferred, if production capacity might be needed to cover shortages of items that are being moved.
- What would be the cost of additional inventory of goods in transit over long distances from China, or another outsourced location, to our customer?
- What additional finished goods (forecasted) would be needed to meet target inventories build and drain?
- What would be the cost of additional safety stocks to ensure uninterrupted supply and seasonal demand?
- What are the inventory supply risks from additional scrap and reject costs associated with the new facilities' learning curve?
- Any impact from the newly emerging "on demand customer?"

- Because all forecasts are wrong, and "the longer the forecast, the wronger the forecast," your forecast will need to be better, or your on-hand inventory will have to increase, or your customer service will suffer. Add the number of days of additional forecast you will need to act on (based on a 45- to 80-day increase to your product lead-time) and project the additional cost to average inventory cost on hand, including the impact of average forecast error.
- The reality of offshoring is that there will be an early impact of out-of-stock conditions causing lost sales. There will also be lost sales due to longer lead-times. These will perhaps be replaced by new market sales, but probably not right away. How will this impact your enterprise?
- Lean is for the office, too. A linchpin in any successful China strategy is to operate lean processes in product development. Lean processes must also include sales and operations planning, lean product design, lean postponement supply chain, lean postponement product configuration, and lean postponement assembly and shipment. Will ours? Are we lean in these processes now?
- Can we get lean in time to support the process of outsourcing?
- Consider IT requirements including cost to install communications equipment and software necessary to manage new data-enabled processes for product development and manufacturing control handoffs and information flows between U.S. operations, China supply, and the customers.

Following the thesis that, in the lean China process architecture, the jobs in the customer-facing processes remain or emerge in the customer product/service market, an argument can be made that most of the jobs in the new lean China supply chain will be in engineering, purchasing and supply-chain management, customer service, and information technology. In product markets, it is probable that final assembly, packaging, shipping, warehousing, and delivery jobs will either stay here or emerge in the customer product market as well.

Supporting a Lean Factory Flow

Although the lean commerce process improvements above should provide an immediate benefit to customers, there are several other process areas that can also be further improved utilizing Lean Commerce. Because of the integrity of the Lean Commerce model, the planning and production scheduling strength of rate-based MPS, MRP, and mixed-model scheduling processes can be coupled with the pull execution of kanban, including supplier broadcast (Internet messaging or EDI, XML, SOAP, and fax) material pulls. Existing ERP database and master files can be utilized to produce kanban tickets in support of mixed-model scheduling. Scheduling processes can be coupled with the pull execution of kanban practices, including supplier broadcast (EDI) material pulls, e-kanbans, and RFID (radio frequency identification).

Kanban is the Japanese word for "signal." A kanban is usually a card or ticket used to trigger inventory replenishment of parts and components stocked in a production facility, line, or cell. A kanban is generated when an item is consumed in a production process. Often, a kanban card is at the bottom of the bin or other container that has been emptied. When an operator pulls the last component out of the container, the card is "sent" to the supplying external vendor or internal supplying cell or department to trigger a resupply.

Providing kanban dispatching capability produces a visual control to authorize production, leveraging the existing work order or orderless-based records. Kanban, a powerful production control technique, is not a planning technique. The kanban can communicate to the workshop what to make, when to make it, and how much to make, but only in the present time period. Kanbans cannot predict what materials or how many of them are needed for future time periods within the cost and operational efficiencies of MPS/MRP processes. However, used within the Lean Commerce approach, they provide significant benefit to production balancing efforts and corresponding quality improvements. Kanban practices are a much more effective production "dispatching" tool, far superior to the now greatly discredited "fixed dispatching" of MRP. Lean ERP utilizes MPS Customer TAKT quantities to develop kanban quantities in lumpy demand scenarios as well as kanban completion to backflush inventory records.

Kanbans can be triggered, utilizing MRP-based buffers and "fudge factors" or on a straight zero inventory basis, at all BOM levels of a product produced in a Lean Production environment. These system kanbans can then be utilized to "pull" the supply of components, subassemblies, and assemblies to buffers or stocking or feeder lanes.

At Toyota North America, the e-kanban system is a parts ordering system with suppliers that is based on the actual vehicle sequence plus an actual consumption adjustment. Parts are obtained and unloaded at the plant based on the actual progress of the assembly line. Of course, efficient and effective use of the e-kanban system depends strongly on the accurate and consistent delivery of parts. In practice a virtual lean logistics management system generates supplier pick-up schedules to the e-kanban system and trailer routes to logistics partners. TPS I/T then calculates pick-up and delivery intervals, taking into consideration supplier locations, cross-stocks, and manufacturing plant requirements.

Kanban cards and mechanisms have been implemented in a wide variety of manufacturers, distributors, and suppliers. As more of these implementations become successful, the idea of utilizing kanban to replace MRP has become fashionable in some lean camps. It is thought that a forecast-based MRP system has too much "push" of detail part predictions, with poor kanban performance as a result. Advocates of Lean ERP understand that too much reliance on MRP can contribute to the high cost–low availability problems of many manufacturing environments. Lean ERP proponents also understand that many of these issues are "user-based"—that is, inadequate use of existing tools for inventory replenishment or overdependence on transaction-based planning and releasing of shop requirements and inventory support and flow cause problems in lean environments, as well as in environments that are not lean. Work needs to be done to align the positive attributes of ERP/MRP with the realities that lean flow controls such as kanban are better "in the flow" than MRP-generated schedules and dispatches.

Lean ERP proponents are interested in the possibilities of solving the problem of applying kanban to the external supplier, whether that supplier is a vendor or an affiliated business facility. It is generally conceded that the benefits of manual kanban are more difficult to obtain when the supply chain includes external suppliers. An e-kanban process is a desirable solution to the mix-up and proliferation of cards that can occur when kanban is utilized with external and especially distant suppliers. When kanban data is formatted in a bar code, electronic communication based on location and part elements of the bar code can facilitate the replenishment processes in every stage, including receiving, shipping, and consumption.

The generation of the e-kanban is another process where Lean ERP proponents think MRP can add value. Utilizing the lot sizing logic as the kanban quantity modifier, an MRP system can be used to generate "period order kanban" quantities, based on the current Customer TAKT generated through Lean Production smoothing (see the Lean Commerce section). A kanban that can rise and fall "to the beat of the customer" means the fluctuations of lumpy demand can be considered at the heart of the lean system.

Allowing your MRP system to "push" material requirements data through the supply chain causes massive disconnection between actual demand and flow of supply. Lean MRP can have positive uses in the Virtual Lean Enterprise. MRP can be the "director" of demand signals that flow continuously through the supply chain, generating e-kanban cards and utilizing Radio Frequency Identification (RFID) to report location and expected arrival, linking to customer demand data flowing through SOA (service-oriented architecture) into the S&OP. MRP also is used to generate period "blanket orders" of finished product demand for backflushing to consume. Actual process costs can be captured as blanket orders are consumed through product shipment of kanban component quantities to keep the entire repository of central data in balance. Kanban can be used in a "dynamic" process utilizing the MRP program logic of ERP software such as SAP in an "event-driven" kanban process that uses actual demands and actual inventory on the floor to determine systematically when to create an MRP requirement. The "event" of a requirement drives the creation of the kanban order, and kanban cards are printed with due-to-stock dates applied. The amount of kanbans produced for each part is based on actual customer demand, in the appropriate period. As software-driven lean flow practices become more widespread, expect real-time data to drive real-time kanban card generation. Some companies and vendors are already delivering some of this functionality.

RFID is an emerging technology that enables a manufacturer to track and review real-time data about the in-stock and in-transit quantities of a part. The effort to implement RFID has been driven in some industry segments by powerful proponents. Wal-Mart and other retailers issued mandates to their suppliers to implement RFID technology, as did the Department of Defense. By the end of 2006, compliance to these mandates was "yesterday's news." That's not to say that it's been easy or cheap. In a lean enterprise, RFID may be a key enabling technology that enables the future Virtual Lean Enterprise.

Advanced RFID applications are now enabling supply-chain and logistics personnel to identify the current location, including warehouse or distribution bin, of a part/quantity as well as the movement of that part/quantity from one reporting location to another. RFID enables the enterprise to match product availability data with the product demand data from the customer. RFID also enables the enterprise to exchange data with partners in the Virtual Lean Enterprise by capturing real-time information and making it available to exchange, with little or no transaction input. That's not to say there are no costs, or no controversies, associated with the use of this new technology.

There is a basket full of issues for the enterprise contemplating RFID applications, and complexity concerns abound for the Lean Performance project manager. It is best to begin the conversation about RFID from the enterprise objectives perspective. The enterprise must ask and answer these three questions:

- What are the objectives of the enterprise for RFID?
- How best can these objectives be accomplished?
- Is RFID a viable and desirable tool for our enterprise?

An RFID operational review begins with a close look at the companies' products. Each industry and perhaps company has different concerns. For instance, the Food and Drug Administration (FDA) mandated requirements for manufacturers of food and beverages that now include the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. In addition to the need for lot controls, this requirement mandates that every manufacturer of food and beverages must be able to submit complete vendor and process history of all lot-controlled ingredients to the FDA when there is an FDA recall of product. In addition to compliance data, all purchased part lots and worked material lots data that is useful or required to maintain is more readily obtained utilizing RFID.

Once a course of action for the enterprise is decided, the Lean Performance project manager can consider the impact of RFID implementation and how best to make use of the data made available upon successful implementation of RFID.

Although issues such as read rates, active versus passive tags, tag cost, readers and compatibility, safety, security, and standards are important, the Lean Performance ERP project manager should focus on the supply chain, inventory logistics, and operations requirements and opportunities of a successful RFID configuration.

The Operations Team defines the needs side, including placement of RFID readers and writers, in order to better provide the IT team with a set of requirements that must be met by the equipment under consideration. The question to ask is "How can we use the data, and what processes will require consideration in order to use that data successfully?"

Most successful RFID implementations start small and build out. The Lean Performance project should include a "pilot" and test scenario in the overall plan, if RFID data is going to be utilized. Successful RFID implementation also involves decisions about standards such as the relatively new Gen2 Standard for Class 1 UHF tags. Standards and equipment choices are the province of RFID implementation, but the compatibility of data in the "back end" of the technology applications will have a lot to do with success on the "front end" of the Lean Commerce model. Some involvement by the Lean Performance project manager and teams is prudent to ensure that the efforts and expenditures of the two projects can work together. One standard that must be in place is SOAP (Service-Oriented Architecture Protocol). This procedure is also referred to as SOA. SOAP, or SOA, is specifically intended for business applications to enable trading partners to conduct Web-based business. Lean Commerce is greatly enabled by SOA and relies on SOA input to drive demand data into the S&OP process.

Although an RFID evaluation and selection is not strictly the province of the ERP project, there is inevitable intersection of the two efforts. The available architecture of ERP, and the connectivity of ERP data and processes, means many an exercise in MUDA of data gathering and input can be avoided utilizing RFID. It isn't just about the "pull." Lean is about the flow, and that also means the data flow. MRP shouldn't be "over-leveraged" in the shop. Skip the schedules and dispatch lists—lean pull and kanban work better, where visible. At the same time, ERP shouldn't be "underutilized" in the shop and the office. It's a matter of cross-communication about process needs, and the best ways in which to flow the MUDA-free process.

Toyota Production System and Lean Commerce

In the years since the publication of the first edition of this book, an IT-enabled "lean commerce" component of the Toyota Production System (TPS) has been developed by Toyota in North America. According to information provided to suppliers, the IT component of the TPS books customer orders and establishes the sequencing of models and all option configurations to produce a leveled schedule for manufacturing. The system algorithms take the current process operation times for each process (every option level) and, based upon the orders (from Toyota sales, not consumers) for each type, spread the build sequence into a daily schedule that is balanced, and then repeat that daily schedule every day for the month. Whether this is an MRP process or an advanced process that builds on MRP logic has not been fully explained.

The system is used by the sales division as well as the dealers to track the status and location of each specific vehicle order once manufacturing begins. Each month the TPS IT system produces three time fence–based planning and scheduling elements. The first is a five-month forecast that can be adjusted and is used for longer term capacity decisions (TAKT). The second is a three-month forecast that can be adjusted "less" (and explicitly not expanded upward) and is utilized to determine mix/sequence in plant and to determine where overtime is necessary (line TAKT). Finally, a one-month order is generated that does not vary by model, option, or sequence. It is used to establish a proper line mix and set the schedule and sequence of "pulls" from suppliers. It is a "fully frozen" schedule.

To predict future demand, TPS IT analyzes data with regard to what vehicles have been built and wholesaled in order to tie that vehicle to the Toyota products that are applicable to it. TPS IT then looks at future vehicle data to try to make a judgment on what the future demand would be for that product. Toyota has reduced time for data gathering and entry in order to drive strategy with market data. A daily order-management network increases productivity of dealers by allowing them to focus on selling cars instead of completing forecasting surveys. The portal also brings the build-to-order process one step closer to fruition. In order for this system to be successful, the standard times for every operation must be accurate in the computer system. As noted above, it is not clear whether this is an MRP-based process or some other advanced process. My position is that these standard times calculations and applications can be accomplished with most "standard" MRP programs contained within ERP-packaged software provided by ERP software vendors.

The Toyota "Lean Commerce" system is an advanced production planning and order management process with a focus on optimizing the schedule to balance, versus optimizing changeovers or utilization. The system achieves a build balance with the hundreds of discrete optioned vehicle types. Toyota has completed business and IT initiatives to speed up build-to-market processes down to about 12 days or less for all North American–built models. The bottom line: Toyota Motor Sales USA has developed a "Lean Commerce" IT-based component of TPS that improves demand forecasting, reduces inventory by half, and slashes the time it takes to fill back orders by nearly one-third. This powerful new synergy between IT and TPS further differentiates Toyota from its competitors.

The continuing transition to Lean Production and the Virtual Lean Enterprise by leading lean practitioners like Toyota in the North American marketplace is also focused on a form of lean customer relationship management that uses Internet-based information technology. For Toyota, this has produced the ability to build a car to order and deliver in some cases in four working days or less. Toyota announced the "ten-day build" for Corollas in August 1999 and relentlessly improved the process to the current four-day performance. The close coordination of customer relationship management, vehicle assembly, and supplier coordination implemented through the vigorous IT approach described above is now a major piece of the TPS, and it will be improved utilizing continuous improvement (*kaizen*) even beyond the current performance. In some respects, it resembles the IT-based supply-chain logistics management processes developed by American retailers such as Wal-Mart and emulated by click and brick enterprises, such as Amazon.com. But it is leaner. And it will keep getting leaner.

The Toyota lean customer relationship management process includes mass customization, enabling the customerwide latitude of order-level product options. This IT-enabled process allows a wider standard model penetration of the market and will further the cost and performance gaps between the lean automotive producers (J-3) and their competition, the remaining mass automotive producers (Big 3).

Remaining aspects of mass production that remain in the Toyota North American TPS are generally the result of the continuing planning demand fluctuations and short order cycle delivery requirements of some customers. Toyota has nearly perfected a direct selling system that does not depend on dealer inventory. It enables the assembly factory to "build to order." However, it still relies on frequent contact with former and future customers, providing a great deal of forecast information available for longer range production smoothing. The key process result is linkage of the information gathered by customer planners (manual orders and forecasts) as well as the information provided directly from customers (EDI orders and forecasts) to the entire supply chain as quickly and efficiently as possible, eliminating any and all bottlenecks.

The Lean Production system developed by Toyota (TPS) is based on the principle of producing only what the customer orders, when the customer orders it. In the North American IT processes of TPS, the production smoothing process begins with a forecast developed at the assembly plant, which is the basis of material and capacity planning. This build plan is given to suppliers, with revisions provided each day. As customer orders come in, TPS/*heijunka* adjusts the build schedule to make the specific car the customer wants. With smoothed forecasts in place, and considering the production lead-time advantages of decades of TPS, when the customer order is received production is pulled through the production system quickly.

Implementing a Virtual Lean Enterprise

Many manufacturing firms are already familiar with lean components: using fewer suppliers, cellular layout, J-I-T operations, TQM, and continuous improvement, less work-in-process, and pull versus push production. During the nearly 30 years since these and similar lean tools and practices became known to U.S. industry, very few firms have become lean. This is, in part, due to a failure of not having all the components of lean: a set of lean principles as well as tools and practices, lean strategies, policies, and design features, managerial and human resource considerations, and much more.

Becoming lean requires extensive and simultaneous change at the organization, management, information, process, and people levels ("Respect for People"). The changes at each level are sufficiently complex and long-term to require separate treatment. There is no quick fix, magic bullet, flavor-of-the-month approach to becoming lean. It requires a long-term commitment to education and training and an understanding of lean and all the lean components. Even then it can become a major challenge to get it all together in successful lean transformation.

Nevertheless, there is an orderly approach to becoming lean, demonstrated by a growing number of successful case histories. The Lean Performance ERP project methodology leverages this body of knowledge to present a step-by-step approach to lean transformation.

Chapter 5

Lean Principles, Tools, and Practices

Lean Cultural Principles

To accomplish a Lean transformation requires that management truly understand the principles, tools, and practices that deliver the power of lean, commit to those principles, and invest in the education that the process owners, operators, and process-area managers need to learn the tools and practices that deliver the Virtual Lean Enterprise. Often we have trouble identifying principles. We think tools and practices are the same thing as principles, but they are not. A principle is something you believe in. For example, lean operational principles are those presented by Womack and Jones in their book, *Lean Thinking*: value, value stream, flow, pull, and the pursuit of perfection. A tool is something you apply that helps you to identify, understand, diagnose, and fix. For example, lean diagnostic, problem-solving, and continuous improvement tools include the 5 Ss, MIFA, 3 MUs, 5 Ws/1 H, 4 Ms, and the SDCA-PDCA cycles. A practice, on the other hand, is something you do once or over and over again, in a process. For example, lean practices include single-minute exchange of die (SMED), cellular layout and flow, and kanbans. When we adopt lean principles in our enterprises and apply lean tools and lean practices to our processes, we develop our own Best Processes. That is the Toyota secret. Toyota developed a set of best lean Toyota processes and is continually improving them.

We all have heard that, in order to get lean, companies must "lean" their processes, working back from the point of product or service delivery to the customer. In a lean enterprise, processes are "pulled" in response to actual customer requirement instead of products and services being "pushed" into delivery or inventory, utilizing the five lean operations principles: value, value stream, flow, pull, and the pursuit of perfection. These are principles we believe in; they inform, permeate, and underlie everything we do. But they aren't enough to get the lean transformation accomplished. It has become evident that lean enterprise has not (yet) emerged in many of the American workplaces that have attempted lean initiatives. Lack of lean culture is the reason.

Lean transformation discussions often drift toward a Japanese cultural discussion. A commonly held belief is that Japanese managers benefit from a culture of social cooperation that extends to the workplace. Fair enough. Toyota believes lean cultural principles are the basis for their organization. Belief in the lean cultural principles led to the discovery of lean tools and lean practices. So a belief in the lean cultural principles enabled Toyota to "invent" lean tools and practices and the TPS lean processes. It appears from this that once your enterprise "gets" lean culture, application of lean tools and lean practices is "natural." Is culture important? It is first.

What is culture? The dictionary states that culture is "the ideas, customs, skills, arts, etc., of a given people in a given period; civilization. Beliefs right and appropriate for the purpose; suitable; fit; proper." A cultural principle is a belief that permeates the ideas, customs, skills, and practices of all of the people in an enterprise. Lean cultural principles are beliefs suited to the tasks in the process of lean transformation and the sustaining lean enterprise. They are not widely adopted in the American workplace.

It is becoming obvious that American competitive business culture does not encourage, develop, or sustain lean, and it is incompatible with the needs of the lean workplace. It might be said that these cultural beliefs are the internal "success rules," almost impossible to change because current leadership has achieved its success using them. American managers often miss inputs from others in the conversation who are not as insistent or "Type A." They are prone to overuse authority and often miss out on ideas from subordinates and others in the workplace because they are more "competitive" than "cooperative." It is clear that one of the critical changes that will be required in the American lean workplace is for American managers to change their competitive management style. In order for American lean to be widely successful, we will need to develop and adopt a set of American-style lean cultural principles.

Often, the process toward lean transformation is sabotaged by traditional mass production cultural beliefs that permeate practices in Human Resource processes, especially job displacement, outsourcing, downsizing, and layoff. Unfortunately, many companies aren't ready, willing, or otherwise able to transform into lean culture. They are failing at lean as a result.

We have made a start, as demonstrated in the team dynamics employed in the operations physical processes in many companies. Now we need to extend that thinking into the office, along with the use of lean tools and practices, to get the management decision and information/support processes lean as well. This book can help if you have a lean culture and are on the lean journey. It works from the foundation of lean physical process success to extend the lean transformation into management decision and information/support processes, resulting in the “Virtual Lean Enterprise.” Here is a review of each Lean Culture Principle and a Checklist for applying them in your enterprise.

Process-Oriented Thinking Means What Before How

When we say “process-oriented thinking means what before how,” we mean that understanding *what* work needs to be done comes first and is the key to determining customer value. Understanding *how* to best do the work with a new machine or tool follows. Exploring how to use new enablers is one way to improve processes. When process performance is improved, you improve the process result. Ignoring the process reduces the chance for improved results, and ignoring results risks missing new ideas and innovations. What this principle facilitates in the team project setting is creation of momentum for the actual tasks as defined by the process owners and operators to be the most important element of the improved process. Technology is about How process requirements are completed and should never be the most important consideration in a process design.

A lean management practice that deploys or supports the lean cultural principle “Process-oriented thinking means What before How” is “manage the process and the result will follow.” This lean management practice at first glance seems to violate a cultural belief in the American workplace: that being that management can drive results by forecasting the result desired and then expecting (demanding) the enterprise to deliver. This lean management practice can only be employed if you can “lead lean.”

Product Quality Results from Process Quality

When we say “Product quality results from process quality,” we mean that improved process quality must be the focus of all innovation, including IT innovation. Information system *quality* means meeting or exceeding process owner and operator and customer requirements. We also mean to underscore the paradigm that all improvement projects are management activities. Process improvement projects are too important to be “orphaned.” Because the lean environments have demonstrated that Process Standards are integral to process quality, then we must use or produce Process Standards. Finally, because process quality is our goal, all projects must be focused on and collect data about specific processes, not just the technologies that enable them. We must be able to demonstrate that the application of technology actually improves the quality of the process, or it is a waste of resources.

Every Process Needs a Process Standard

Every process needs a Process Standard because process standards facilitate communication. Without a Process Standard, how can you agree on what the process is? Process standards connect process owners/operators and technologists, and provide a basis of understanding that allows insight for improvement. Process Standards make it possible to recognize downstream process requirements for timely and full availability of information, decisions, and material.

If your company employs a results measurements-oriented management approach, how have you even developed reliable measurements reporting without Process Standards that contain control points and consistent application of measurements and diagnosis at those control points? Without a Process Standard, how would you know when cost, quality, and delivery results improve? What would you measure against? Again, Lean Production environments have demonstrated that Process Standards can be used to stabilize a process by establishing process control and check points for measurement and improvement. Process Standards also ensure the long-term success of the organization by protecting the company's knowledge base and by recording, preserving, and facilitating cross-training on company expertise. The lean mantra is simple. Where Process Standards do not exist, processes are unstable, measurements are unreliable, maintenance costs are higher than they need to be, and improvements are generally either not attempted or are unsuccessful.

There are two types of Process Standards. Managerial Process Standards document organizational-level processes. They are produced during process stream mapping and MIFA mapping activities. Process standards that document organizational-level processes for departmental, divisional, and administrative benefits and policies are also managerial Process Standards. Operational Process Standards document *what* work is done and *how* work is done in the activity-level processes. In the Lean Performance project, these are process workflow standards and work instructions.

Most management decision processes are not managed as processes. When managers solve organizational problems (e.g., morale issues, business process deficiencies, metrics that aren't acceptable, etc.), it is common for them to just informally start generating responses or solutions without using any formal, structured problem-solving tools such as root-cause analysis.

The key features of Process Standards are that they are the easiest and safest way to do the work. They are the best way to preserve know-how and expertise. Process Standards provide a basis for measurement. They demonstrate relationships and results of examining cause and effect and provide a basis for maintenance and improvement. Process Standards provide a basis and objectives for training, as well as checkpoints for audit and prevention of error recurrence.

One task a Lean Performance ERP project manager can perform to solidify the understanding and use of Process Standards is to ask every manager in the enterprise to identify one of his or her own processes and produce a Process Standard for it. Each participant in this exercise should:

- Name the process
- State the process purpose
- Write down the process tasks, inputs, and outputs
- Measure/estimate QCD baseline
- Identify value added versus nonvalue added
- Eliminate waste
- Report improved QCD
- Repeat

Utilizing the Process Standard, and any of the relevant lean tools, the managers should then identify value-added tasks versus nonvalue-added tasks. Eliminate the tasks that do not provide value, considering the overall needs of the customer as well as the downstream processes. Report the improved QCD. Repeat. This provides the buy-in tone that the other process owners and operators in the enterprise need, and sets an example that they can follow.

The Process Owners and Operators Are the Process Experts

If your people believe that the traditional managers who want to run things the way they always have are the ones who decide what lean events will happen, what improvements will be made, and how the enterprise will execute those improvements, then you are most emphatically *not* getting lean. Management domination and command and control administration of the workplace does not nurture and sustain lean transformation. It defeats the very people who are the foundation of lean and leaves management wondering why people are skeptical, or aren't contributing, or both. That's not to say that the process owners and process operators are always immediately enthusiastic about lean. There can be numerous points of resistance. Often, process owners and process operators do not agree there's a problem with the current process. Perhaps they don't agree that the cause is batch processing or that lean (or use of smaller batch sizes or one-piece flow) is the solution. In fact, they may think that more problems will be created if lean is introduced. They also may think that holding a process *kaizen* class or event means they weren't doing a good job before.

This author has had the unfortunate experience of being the facilitator in a process stream mapping exercise when a middle manager made this denigrating remark about those present: "We will present our process, but I don't think the 'shop folks' will understand it." I then asked, "Will you be able to understand the processes being presented by the other [shop] teams?" Her reply: "Of course." I responded, "So, I am to take it that you can understand what they do, but they can't understand what you do?" Her answer: "Yes." It never dawned on her that all were shaking their heads at her ignorance and elitism. Not surprisingly, her process presentation was not very enlightening. Taichii Ohno had a phrase for managers (and others) who believed their work was above scrutiny, but that process operators' work was not: He called them cementheads. Be on the lookout for them. They will sabotage your lean transformation. One lean facilitator told me that when he encounters a "cementhead" he recommends that said "cementhead" be given an opportunity, at the earliest possible time, to seek employment in a mass production environment. Why? Because in a mass production environment their views will fit the management paradigm and they will be happier. They are not going to be happy in a lean-empowered workplace. And we won't be happy with them.

Another workshop tool may be useful to illustrate a commonly held false belief among the cementheads. Ask a group of managers/supervisors this question: "Do you know your job better than your boss knows your job?" Asked this question, even in a workshop or class session, virtually all managers or supervisors will agree, that, yes, they do know their own jobs better than their boss understands the jobs. However, when asked whether or not their direct reports know their own jobs better than they—the managers and supervisors—know them, the response is nearly unanimous: no, the direct reports do not know their own jobs better than those managers and supervisors know those jobs—even though the process operators perform those very jobs day after day!

When the enterprise endorses the lean cultural principle "the process owners and operators are the process experts,"—each at their organizational or activity level of process—then the enterprise is truly empowered! Of course your direct reports know their jobs better than you do. If not, you have failed to teach them and are responsible for the poor output quality, cost, and delivery. Even though it has become common to ask who knows more about a task than the ones performing it, it is seldom taken to heart by management.

In summary, empowerment is incorporated into lean enterprise systems as an inherent element of the work processes. Lean processes are built on the belief that the people who do the work are best qualified to improve it and that people who are empowered to turn their ideas into improvements are best motivated to continuously improve the work processes.

The statement that the process owners and operators are the process experts implies that today's process is as value added as the use of current tools and enablers will allow, and the process owners and operators are doing the best job that they can. When processes are identified, process owners and customers are all able to help in improvement, if they are empowered. The process experts know what work must be accomplished in the process. The process customers know what they want from the process output, product, or service. Process experts design and implement process Lean Performance improvements.

The preceding notwithstanding, the dilemma faced by many IT professionals is that information/support and management decision process owners and operators are often unwilling to even discuss the opportunities present in a new software tool, let alone empower the process operators to do so. This phenomenon has caused the failure of many an information system–based improvement project. Many times the information technology engineer or analyst cannot penetrate past the process owners' and operators' view of the process as a set of tasks that include the tasks performed by the current system enabler. They don't think about the presence of specific requirements in their process, requirements that compose the process, no matter what the enabler might be. The key characteristic of the Lean Performance methodology is a preoccupation with providing that separation in the mind of the process owner between the process *Whats* and the enabling *Hows*. The process workflow standard is the lean tool employed, and it eventually will become the technologists' greatest ally in applying new system enablers in the Lean Performance environment.

The Next Process Is Your Customer

When you believe that the next process is your customer, every team member has the obligation to never pass on inaccurate data, information, decisions, or material. It's not OK to fix my process by breaking your process (or to make my standard by giving you scrap). The adoption of this principle in the business culture is the prime force in the creation of the empowered workplace, and it is the epitome of the greater application of the team concept across the Virtual Lean Enterprise.

Loyalty to People Enables Continuous Improvement

The American Lean Champion will need to formalize a method of Policy Deployment for his or her enterprise in order to "lead lean." Policy Deployment is a lean management tool, also known as *hoshin kanri*, or *hoshin* planning. It is based in the Management By Objectives system developed by the American management guru Peter Drucker. Policy Deployment also incorporates the Plan, Do, Check, Act (PDCA) improvement cycle, a lean continuous improvement tool developed by the American quality control guru W. Edwards Deming. The PDCA cycle is utilized to improve the Process Standard that results from the SDCA (Standardize, Do, Check, Act) cycle, which I will discuss below. In the PDCA cycle, a Plan (P) for improvement is determined and documented on the Process Standard. The proposed change is then Done or Demonstrated (D), Checked (C), and implemented or Acted upon (A). What *hoshin kanri* provides is the planning, implementation, and review process for managed change, aligning management policy with daily operations and the improvement activities that are ongoing in a lean enterprise. Lean business policy can be as straightforward as the endorsement of lean expressed as one of the lean business policies of the Big Global Enterprise: "The Big Global Enterprise is committed to being the leanest, highest quality, lowest cost and fastest to market provider of sprockets, grommets, and widgets in the world."

The "Loyalty Principle" is without doubt the single most difficult principle to interpret and implement in the American lean workplace. An operations manager at a major defense contractor put it like this: "American companies pick the right words for their mission statement but typically fall short on backing it up—'we value people,' which is found in so many mission statements, is cryptic in application. People are valued as long as (profit) is double digit and the stock is up—otherwise, 'see ya later.' " In the American workplace there is a widespread attitude that the worker is disposable, and that doesn't work for lean. What will? Even recognizing and exposing the "disposable worker attitude" raises American managers' eyebrows.

Lean human resource management practices emerging in the American lean workplace include staffing permanent positions at 80 percent of expected down-period volume, with "temp" pools used to cover higher market demand. In these companies, the first preference for a permanent opening is given to temps, who are recommended for permanent positions by the process teams that have worked with them. Another lean human resource practice is job sharing, with two employees splitting work time, often when they are experiencing a life situation (pregnancy, illness in family, etc.) that might otherwise result in a good employee leaving and taking lean training and team attitude with them. Lean companies provide benefits even when full-time hours are below 37 per week. Flexible start and finish times and overlapping shifts where the workers "manage" the coverage are options being tried to manage demand fluctuations. The key is that people are assets that are managed without layoff and with human kindness and consideration. Is there a payoff? One process control manager (in an award-winning lean facility) put it to me like this: "I do not want my trained people laid off for a period of time and going to work across the street at my competitor. I have an investment in them, and I consider them to be valuable. I treat them as the asset that they are, and they reward me with their effort."

The real opportunity from going lean is to be able to do considerably more work with the same resources at almost no additional cost. What will it take to generate this extra work, either in extra orders or taking some activities back in-house? Or how are you going to handle the need to reduce headcount without bringing your lean efforts to a halt? A good starting point is to develop policy initiatives to leverage lean benefits at the operator level:

- Ergonomic benefits
- Education benefits
- Lean bonus or gainsharing
- Profit-sharing benefits
- Increased hourly rates for cross-training
- Team-based performance incentives

What appears to be critical to lean transformation success is a cultural belief that views every individual process owner or operator as a person capable of making a positive contribution to the improvement of a process. A key lean cultural practice is the fostering of "permission" to take a risk and trust others in the workplace. The lean cultural practice of "permission" enables process owners and operators to communicate the things the organization must improve in all of its processes to achieve lean transformation.

Lean human resource practices are the new frontier of Lean Performance management. Two companies may have different products, different markets, different structures, different management styles, different processes (especially product design and marketing), and different human resource management policies. Indeed, different HR policies may be equally successful in managing the people of each company. It's a matter of culture.

A beginning can be made in your transforming enterprise by conducting a management policy deployment exercise that asks for suggestions from the process owners and operators on the following question. What step or steps should we take as an enterprise to value our employees during the coming lean transformation project? Utilize the ideas gathered to develop lean business policy that address company headcount concerns. These concerns will require decisions and commitments on issues such as:

- No layoffs during lean transformation
- Layoffs only when market volume declines, not when efficiencies improve
- One "restructuring" layoff, followed by a commitment to market volume layoffs only

Expand the policy deployment initiatives to present and discuss opportunities to leverage lean benefits at the operator level. Process owners and operators will respond to questions that ask them how the enterprise should go about developing and distributing benefits in the area of ergonomics, education, bonus, gain sharing, and profit sharing. Two widely adopted lean HR practices are the payment of increased hourly rates for cross-training and team-based performance incentives. See Figures 11.4 through 11.7 for examples of how to use the GAP analysis to complete this activity.

"Loyalty to people enables continuous improvement" means that in a lean enterprise we don't blame, we improve. We don't judge, we fix. Mistakes are opportunities. We challenge the obvious. In a lean enterprise, it is OK to fail in the pursuit of goals. We know that not trying means not failing, but we try because failing is OK. Not trying is not OK.

Lean Performance in a culture of cementheads doesn't work very well. Cementheads are people who will not consider or learn anything beyond what they already have in their heads (i.e., the set-in-concrete ideas of their own past experience and learning). Lean Performance is new learning and ideas based on experience outside of the mass production paradigm. In Lean Performance, no one gets fired for improving a process, even if that improvement eliminates the task that you perform. If we fire everyone who is good at improvement, who do we have left? Lean Performance requires commitment to lean cultural principles—the true test is when things get tough.

Process Data and Measurements Drive Process Continuous Improvement

For process data and measurements to drive process continuous improvement, always begin with a Process Standard. As stated above, without a standard, you cannot understand the process. And no one else will understand it either. The vast chasms that exist between the various styles and abilities of people involved in the deployment of enabling process technologies, the process owners and operators who will employ those enabling technologies in their processes, and the process customers who must approve the outputs of those processes are obvious to all who consider the real complexity in the workplace and the various opinions about it. In order to deploy management policy using measurable objectives to the process owners and operators, management must have a task-based measurement of the baseline results of the process as it is currently performed. Process continuous improvement is based in measurable and identified process inputs, tasks, and outputs, not in opinions about them. In Lean Performance we ask questions until all questions are asked, then we try to answer them. A new question is always the most important item. Only then do we measure the current process results at a task level to determine current process results in cost measurements, quality measurements, and speed or delivery measurements.

The following checklist may be useful in applying lean cultural principles in your enterprise.

Lean Cultural Principles Checklist

Process-Oriented Thinking Means What Before How

Understanding *what* work needs to be done comes first and is the key to determining customer value. What is our current method for determining the *what* process flow for a process? What is our current result with the implementation of new processes?

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Understanding *how* to best do the work with a new machine or tool comes next. Exploring how to use new enablers is one way to improve processes. How do we currently evaluate the fit of a new enabler to an existing process? Where can this be improved?

When process performance is improved, you have improved the process result. How have process improvements performed recently been measured?

Ignoring the process reduces the chance for improved results. Do current performance measures include process quality, cost, and delivery performance?

Ignoring results risks missing new ideas and innovations. How do we currently capture or review process results data?

Process-oriented thinking is people oriented. It improves morale and communication. How are process improvement ideas and suggestions collected currently?

Product Quality Results from Process Quality

Improved process quality must be the focus of all innovation, including IT innovation. What is the process quality of current key IT-enabled processes? How is IT process quality data gathered?

Information system *quality* means meeting or exceeding process customer requirements. How are process customer requirements documented today?

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All improvement projects are management activities and must use process standards. How up to date are the process standards for key management, information, and physical processes?

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All projects must be focused on and collect data about specific processes, not just technologies. When improvement projects are attempted, are efforts made to collect process data and to use process data in the development of process requirements and standards? How are data and process requirements collected and utilized?

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Every Process Needs a Process Standard

Process Standards facilitate communication. Without a process standard, how can you agree on what the process is?

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Process Standards connect process owners/customers and technologists. Process Standards provide a basis of understanding that allows insights for improvement. What are your recent improvement results when deploying technology?

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Process Standards make it possible to recognize downstream process requirements for timely and full availability of information, decisions, and material. How are these downstream requirements identified and improved today?

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Without a Process Standard, how would you know when cost, quality, and delivery results improve. What do you measure against today?

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Process Standards are used to stabilize processes by establishing process controls and checkpoints for measurement and improvement. How is the stability of a process ensured today?

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Process Standards ensure the long-term success of the organization by protecting the enterprise knowledge base and by recording, preserving, and facilitating cross-training on company expertise. How is company knowledge and expertise preserved today?

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Where Process Standards do not exist, processes are unstable, maintenance costs are high, and improvements are not attempted or are unsuccessful. What is your track record concerning process stability, maintenance (including computer) costs, and success of improvement attempts?

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The Process Owners and Operators Are the Process Experts

Today's process is as value added as the use of current tools and enablers will allow. How often are the value-added tasks identified and the MUDA (waste) removed?

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When processes are identified, process owners, operators, and customers can all help with improvement. How is this activity performed today?

The process experts know what work must be accomplished in the process. How are the process operators empowered to monitor the QCD (quality, cost, delivery) factors in processes in your enterprise?

The process customers know what they want from the process output, whether product or service. How do these process customers provide their input on process QCD today?

The Next Process Is Your Customer

Every team member has the obligation to never pass on inaccurate data, information, decisions, or material. Is this how things are done today?

It's not OK to fix my process by breaking your process (or to make my standard by giving you scrap). How is this ensured today?

Loyalty to People Enables Continuous Improvement

Don't blame, don't judge. Dissension and controversy kill process improvement. How are conflicts handled today?

Mistakes are opportunities. Is it OK for everyone to highlight a process glitch causing QCD shortfall?

Challenge the obvious. Are there any sacred cows/untouchable processes in your enterprise?

It is OK to fail in pursuit of noble goals. What is the last noble goal pursued by your enterprise?

Not trying means not failing. Try because failing is OK. Not trying is not OK. How much freedom is there to try new ideas in your enterprise?

In Lean Performance, no one gets fired for improving a process, even if that improvement eliminates the task that you perform. What is the plan for utilizing process owners and operators who are available for other assignments when they are freed from MUDA in their processes?

If we fire everyone who is good at improvement, who's left? How will we determine who may not be needed and why in our new lean enterprise?

Lean Performance requires commitment to lean cultural principles, and the true test is when things get tough. What tough challenges do you anticipate and how will you address them?

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Process Data and Measurements Drive Process Continuous Improvement

Always begin with a Process Standard. Without a standard, you cannot understand the process. Do we have Process Standards, and if not how will we get them?

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Process continuous improvement is based in measurable and identified process inputs, tasks, and outputs, not in opinions about them. How do we develop process continuous improvements today?

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Ask questions until all questions are asked, then try to answer them. A new question is always the most important item. Are questions encouraged today?

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Measure the current process results at a task level to determine current process results in cost measurements, quality measurements, and speed or delivery measurements. Is this performed today?

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Lean Transformational Principles

Precisely Specify Value by Product or Family

To "precisely specify value by product or family" means to focus any analysis or improvement only on the product or service that the process customer would specify as being what he or she needs as the output from a given process. It is measured by what the customer is willing to pay.

Identify the Value Stream for Each Product

To "identify the value stream for each product," identify the sequence of tasks that produces the output the customer is willing to pay for. This doesn't show the sequence of data. The customer is generally not interested in paying for data that supports a process. It is only a necessary presence, and only when it reduces cost, improves quality, or speeds delivery. Value-added tasks can be identified within the process stream by taking the role of the customer and asking, "If I were the customer of this process, would I be willing to pay for it?"

A value-added change is a change to a process/task that the customer would see as a change that makes the process or process output more valuable to them. It may be a change that the customer requests, that is a legally mandated requirement, or one that is proposed by the process owner, staff, or management.

Make Value Flow Without Interruption

To "make value flow without interruption" is to develop the uninterrupted movement of a product through the steps in a process and between processes. Now, think about the paper and data process—do they flow in your enterprise?

Let Customer Pull Value from the Process Owner

To "let customer pull value from the process owner," the signal to initiate a process must come from a downstream process and ultimately the customer. In a Lean Performance project, team members develop improvements by working backward (pull) through all processes to identify customer requirements in the process stream.

Pursue Perfection

To "pursue perfection," maintain and continuously improve the elements of the four preceding principles, and those elements are process tasks.

The following Checklist can be used in determining how lean transformational principles can be or are being utilized. To facilitate the Lean Transformation in your enterprise. Visit the management, information/support, and physical process workplace. Analyze a process or processes in each area in terms of the lean transformational principles.

Lean Transformational Principles Checklist

Precisely Specify Value by Product or Family

Can you clearly identify the process?

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Is there an up-to-date process standard (BOM, routing, procedure, workflow, work instruction) with *all* process tasks/steps identified?

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Could anyone in the company perform the process, after some training, based on the process standards?

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Identify the Value Stream for Each Product

Are there any tasks performed in the process that are not included on the standard?

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Do these tasks provide customer value? Would the customer pay for them if he or she knew we were doing them?

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Make Value Flow Without Interruption

Does the process have any built-in interruptions or delays? Any side journeys for WIP? (WIP includes paper, by the way.)

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Let the Customer Pull Value from the Process Owner

Is the process directly connected to the customer? Does the process owner deal directly with the end customer? If so, does the process owner review the process with the customer regularly to ensure customer satisfaction?

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Is the process customer internal? If so, does the process owner review the process with the customer regularly to ensure customer satisfaction?

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Pursue Perfection

Is there a regular review of the performance metrics (cost, quality, delivery) of the process?

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Is it OK for the customer to suggest improvements to the process?

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Make a list of tasks where the lean transformational principles could be applied in your process to make it better (i.e., more value added).

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Identify any recent improvements. Did these meet the goals of the lean transformational principles?

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Other observations:

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Lean Diagnostic Tools

3 MUs

Until now, the lean diagnostic tools have been employed almost exclusively in the physical processes. We will encourage the use of these tools in the management decision and information/support processes in the section on Lean Performance Improvement, later in this book. For now, it should be sufficient to let your imagination play over the cultural impact of using these tools in the office environment, especially in the information systems "workshop." The discussion of the lean diagnostic tools begins with the 3 MUs. The 3 MUs are:

- *MUDA:* Waste in all its forms. At a deeper level any activity that does not add value is MUDA.
- *MURA:* An irregularity, discrepancy, or interruption in the flow of work, the operator's job, or the production schedule.
- *MURI:* Any condition that causes strain or stress for workers, machines, and work process.

Here is a checklist to assist Lean Performance teams in the application of the 3 MUs. Working as a team, any team consisting of process owners, process operators, and process customers can apply this 3 MUs checklist to any process, office, or shop, and find the MUDA:

Forms of Waste (MUDA) in the Workplace *Where Observed*

Overproduction

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Forms of Waste (MUDA)	*Where Observed*

Inventory

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Repairs/Rejects

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Motion

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Processing

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Waiting

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Transport

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Manpower

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Technique

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Forms of Waste (MUDA)	*Where Observed*

Method

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Time

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Facilities

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Jigs and Fixtures

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Materials

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Production Volume

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Inventory

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Place

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Forms of Waste (MUDA) *Where Observed*

Way of Thinking

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Repairs/Rejects

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Layout

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Distance Traveled/Part

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Downtime

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Cycle Time

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Lead-time

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Queue Time

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Forms of Waste (MUDA)	*Where Observed*

Setup

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Equipment Utilization

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Maintenance

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Safety

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Material Flow

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Standards

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Work Measurement

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Storage Areas

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Forms of Waste (MUDA) *Where Observed*

Quality Assurance

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Control Points

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Housekeeping

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Other Observations:

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5 Ss

The first of the 5 Ss is sort to classify all items in the workplace as necessary or unnecessary. Having done so, teams then remove all unnecessary items.

The next is straighten to classify necessary items by use, and then to arrange items to minimize search time. "A place for everything and everything in its place."

Scrub follows clean the work environment and everything in it, including machines, tools, floors, walls, storage areas; that is, everything. Eliminate the cause or source of recurring stains, spots, or debris.

Teams then move to spread/standardize the application of 5 Ss by developing checklists that help to make sort, straighten, scrub easier on a routine basis.

Lastly, we systematize/sustain the sort, straighten, and scrub using checklists in a systematic way, as part of the daily work routine and worker discipline.

Here is a checklist to assist a Lean Performance team to perform the 5 Ss in their process.

Guidelines for Sorting (5 Ss)

Select a designated portion of the work area that can be worked on immediately.

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Limit the area to show results of an intensive thorough sorting. (Do not make a superficial sort of a particular item over a large area.)

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____

Remove anything from the work area that will not be used within 30 days.

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____

If in doubt about the necessity of an item, red tag it and decide later.

____
____
____

If an employee thinks a necessary item has been red tagged, require that he or she demonstrate its necessity.

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____

Ask why these unnecessary items have accumulated. For example: What kind of an ordering system do we have?

____
____
____

What kind of scheduling system do we have?

____
____
____

Guidelines for Straightening (5 Ss)

Classify items by use.

Arrange to minimize search time.

Designate a permanent place for each item, including volume if multiple items are required.

Mark floor space for designated items.

Provide wallboards, bins, etc., as needed for required tools, fixtures, jigs, parts, maintenance equipment, etc.

When complete, any abnormality in the location of items should be readily apparent. Anything still out of place?

Guidelines for Scrubbing (5 Ss)

Clean everything—machines, tools, floors, walls, container, racks, etc.

Check as you clean. Look for malfunctions (i.e., oil leakage, cracks, loose fasteners).

Red tag all malfunctioning items. Follow up to ensure action.

Paint walls and machines.

Paint floor lines as designated for usage in the previous step.

Guidelines for Systematizing (5 Ss)

Develop a systematic approach to sorting, straightening, and scrubbing, including:

What to check.

What action to take.

Who should undertake what tasks.

When they should be done.

____

____

____

Identify all items that are part of a specific job.

____

____

____

Identify supervisory and managerial roles and responsibilities.

____

____

____

Guidelines for Sustaining (5 Ss)

How will you make the preceding four steps a "way of life"?

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____

How will your company adopt them as a way of working?

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How will your company continually improve based on constant reevaluation by workers, supervisors, managers, and members of the continuous improvement group or unit?

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____

How will your company recognize and reward both group and individual efforts through the evaluation and compensation system?

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____

____

5 Ws-1 H

The 5 Ws and 1 H focus the effort of lean improvement on who, what, where, when, why, and how questions at the process activity level. We will utilize these tools during the value-added process analysis activities of Lean Performance Analysis.

Here is a checklist to use with the Lean Performance teams:

Who

Who does it (usually)?

____

____

____

Who is doing it?

____

____

____

Who should be doing it?

____

____

____

Who else can do it?

____

____

____

Who else should do it?

____

____

____

Who is doing 5 Ss and 3 MUs in this process or area?

____

____

____

What

What is supposed to be done?

____
____
____

What is being done?

____
____
____

What should be done?

____
____
____

What else can be done?

____
____
____

What else should be done?

____
____
____

What 5 Ss and 3 MUs are being done?

____
____
____

Where

Where are we supposed to do it?

____
____
____

Where is it done?

____
____
____

Where should it be done?

Where else should it be done?

Where are the 5 Ss and 3 MUs being done?

When

When are we supposed to do it?

When is it done?

When should it be done?

What other time can it be done?

What other time should it be done?

Are there any time-dependent 5 Ss and 3 MUs?

____
____
____

Why

Why is he or she supposed to do it?

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____
____

Why do it?

____
____
____

Why do it there?

____
____
____

Why do it then?

____
____
____

Why do it that way?

____
____
____

Are there any 5 Ss or 3 MUs in our analysis?

____
____
____

How

How are we supposed to do it?

____

____

____

How is it done?

____

____

____

How should it be done?

____

____

____

Can this method be used in other areas?

____

____

____

Is there another way to do it?

____

____

____

Are there any 5 Ss or 3 MUs in the method?

____

____

____

4 Ms

The 4 Ms checklist focuses team efforts on the man, machine, material, and method issues of value-added process analysis. While these obviously apply to physical processes, we propose that they can be useful in the value-added analysis and improvement of management decision and information/support processes.

Here is a checklist for use by the Lean Performance teams:

4 Ms Checklist

Man
Machine
Material
Method

Man (Operator)

Does he/she follow standards?

____
____
____

Is his/her work efficiency acceptable?

____
____
____

Is he/she problem-conscious?

____
____
____

Is he/she responsible (accountable)?

____
____
____

Is he/she qualified?

____
____
____

Is he/she experienced?

____
____
____

Is he/she assigned to the right job?

____
____
____

Is he/she willing to improve?

Does he/she maintain good working relations with coworkers?

Is he/she physically able to do the job?

Machine (Facilities)

Does it meet production requirements?

Does it meet process capabilities?

Is the oiling/greasing/lubrication adequate?

Is the operation stopped often because of mechanical trouble?

Does it meet precision requirements?

Does it make any unusual noises?

Is the layout adequate?

Are there enough machines/facilities?

Is everything in good working order?

Material

Are there any mistakes in volume?

Are there any mistakes in grade?

Are there any mistakes in brand name?

Are there any impurities mixed in?

Is the inventory level adequate?

Is there any waste in our use of material?

Is the handling of material adequate (safe, sanitary)?

Is the handling of the material wasteful?

Is the work-in-process visible?

Is the layout adequate?

Is the quality standard appropriate/achievable with material provided?

Operating Method

Are the work standards adequate?

Is the work standard up to current?

Is it a safe method?

Is it a method that ensures a good product?

Is it an efficient method?

Is the sequence of work adequate?

Is the setup adequate?

Are the temperature and humidity adequate?

Are the lighting and ventilation adequate?

Is there adequate contact with the previous and next processes?

____
____
____

Other comments:

____
____
____

Lean Performance Practices

Management Policy Deployment

Lean Performance practices are those practices that will be employed in the project to accomplish our intended result. I will cover each of these specific topics, as well as many others, in the project work plan as it is presented below, in project task sequence. I will introduce some of them briefly here, as they provide the integrating strategies driving the entire methodology.

In the Lean Performance project, lean business policy and strategy drive management policy deployment. Management defines lean business policies, and lean project strategies are defined by management, key users, and project team members. Project objectives are then defined by Lean Performance project team members, including process owners, process customers, and the information systems team. A Lean Performance Analysis determines processes where policies can be deployed, benefit can be measured, and software or other process enablers require improvement in order to meet project objectives. Modification to current systems, machines, or other process enablers are only approved where payback is demonstrated, in a process where teams define *process* performance measurements for their own processes, concentrating on lean measurements of quality, delivery, and cost. Processes are then implemented and performance is measured by the process team, with results monitored by management. The Lean Performance Analysis is then utilized to continuously deploy lean business strategy after the project concludes. Some examples of lean business policies that can be deployed are:

- Process Focus and Process Thinking
- Quality First
- Total system thinking
- Support World-Class Manufacturing
- Support Lean Manufacturing
- Support Global Standardization of Processes and Systems
- Support Lean Servicing

Lean business policies are achieved in the project result by deploying lean project strategies to the team and process levels. Lean project strategies communicate business and systems strategies expressed in business and strategic plans. They are identified by the second echelon of management, the level below the policy formulators. The process of deployment continues to the manager or middle manager level, deploying project objectives to apply the knowledge of managers and team members to determine processes where lean project strategies can be achieved. Finally, the IT deployment is performed by information systems engineers, to apply software capability and knowledge. The process deploys in this fashion:

- Lean business policy deployed:
  - Support lean manufacturing
- Lean project strategies deployed:
  - Support improvement of agility and reduction of lead-time
  - Reduce storage of WIP and staged materials
- Lean project strategy selected:
  - Reduce storage of WIP and staged materials
- Project objective:
  - Reduce or eliminate the returned goods storage room
- Technology deployment:
  - Implement online credit capability of ERP software

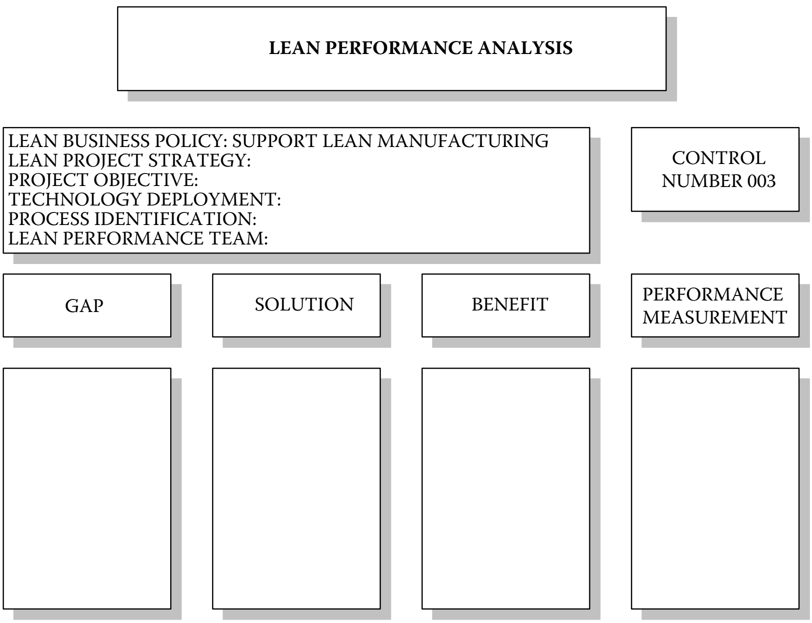


Figure 5.1 Lean Performance Analysis: Lean Business Policy Deployed

Lean Performance Teams

In the Lean Performance Analysis, the Lean Performance teams complete a process workflow standard for each process, identifying in their process where a gap exists in meeting the deployed policy. Process or system gaps are functionality sought or needed by process owners, operators, and customers to achieve project objectives. The Lean Performance teams document process solutions or GAPs, and document the benefit to be obtained by implementing the new process or another solution, including a software modification. Although a process workflow and work instructions are completed for every identified process, the teams define a Lean Performance measurement only for each deployed policy/process combination.

Lean Performance teams include and empower process owners, operators, and customers to take responsibility for Lean Performance. The team-based activities enable process owners, operators, customers, and IT engineers to improve communication and "speak with data." This synergy eventually enables shop floor improvement initiatives to have an impact upstream. We began with the assumption that 85 percent of cost is upstream from the shop floor, so why would we concentrate our improvements only on the shop floor?

Cross-functional Lean Performance teams are then formed to identify common processes across multiple sites and to facilitate the eventual completion of tasks necessary to the implementation of enabling software. Multiple site teams working on common or similar processes communicate and share process workflows and work instructions. With an effective prioritization and handoff of process documentation, teams at each site can more readily determine what works best in their process at their site and revise Process Standards accordingly. The cross-functional Lean Performance teams structure discussed below is:

- Human Resource Team
- Finance Team
- Engineering Team
- Materials Team
- Operations Team
- Information Team

To plan the project, management completes a number of tasks:

- Confirmation of lean vision
- Identification and deployment of lean business policies
- Identification and deployment of lean project strategies
- Project mission statement
- Project scope statement
- Identification and deployment of project objectives

I will explore fully how to complete these tasks below.

To prepare for the project, the Lean Performance project team thinks cross-functionally about how processes affect internal and external customers. Team members determine what their processes are and who their process customers are. Team members determine what their customers' value as the process output, and then deliver it.

Visual Management

Visual management facilitates communication between the project team, process owners, operators, and customers, company engineers, including IT engineers, and the steering committee. Many visual management tools are used in the project, including the:

- Project Summary Bar Chart
- Project Organization Chart
- Process Areas Overview Diagrams
- Site Configuration Diagrams
- Material Information Flow Diagrams
- Workflow and Work Instruction Diagrams

To be blunt, the use of visual management is as much about pushing tasks to completion as it is about using visual tools to communicate. Among other uses of visual management, we will discover and document the process architecture of the firm, beginning with the assumption that processes are generally found in the areas of a manufacturing firm illustrated in Figure 5.2.

A Process Overview Diagram is developed for each implementation site that identifies process areas according to the Lean Performance team. Figure 5.3 illustrates the process overview developed by a team at an international site.

Site-level Lean Performance teams are then defined and illustrated by the site-level Lean Performance team diagram. All processes have a process owner and customers identified. The team is developed according to the process structure. Figure 5.4 depicts the team developed at the international site illustrated in Figure 5.3.

Lean Performance Analysis

After site leaders and Lean Performance teams identify the processes in each of the process areas for their site, business process listings are developed for each site. Common organizational processes and site-specific organizational and activity processes are identified, if the project is multisite. In a single site or multisite project the

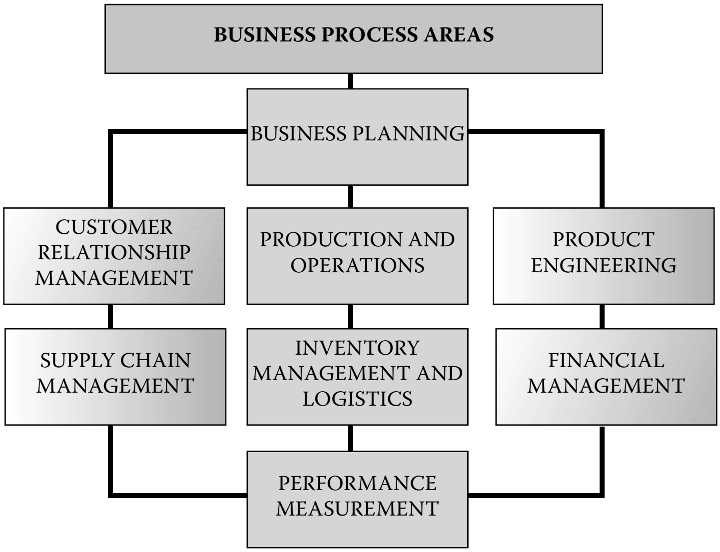


Figure 5.2 Business Process Areas

processes are listed in a sequence that defines the priorities best for the project. This is illustrated further in Figure 10.7.

The policy deployment activity includes the opportunity for the information team to identify opportunities to utilize new technologies with which they are familiar in order to implement the policies deployed. Next, the Lean Performance teams identify the process that best addresses the policy and technology that the Lean Performance analysis technology deployment identifies. An example is shown in Figure 5.5.

Process Standards are completed for each process identified, if that process survives the improvement activities. Process Standards include Process Workflows and Work Instructions, as illustrated in Figures 5.6 and 5.7.

Teams will identify GAPs, solutions, benefits, and performance measurements during the project, and then continuously as the central instrument of continuous improvement. This is accomplished by using a lean practice called the Lean Performance Analysis. To complete Lean Performance Analysis throughout the enterprise, the Lean Performance project teams will:

- Identify all processes
- Develop process architecture
- Prioritize Process Standards (Process Workflow) definition sequence
- Perform Lean Performance Analysis
- Produce Process Workflow Standards
- Produce Process Work Instructions

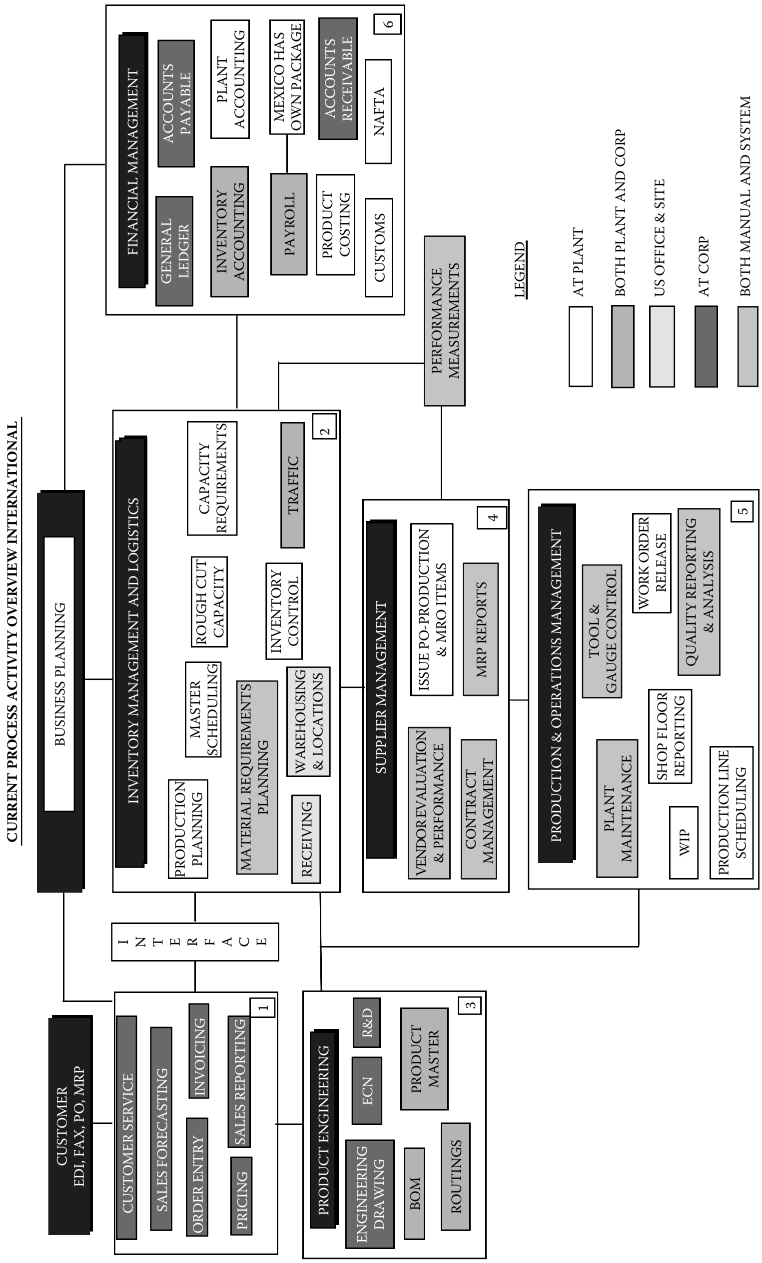


Figure 5.3 Current Process Activity Overview: International

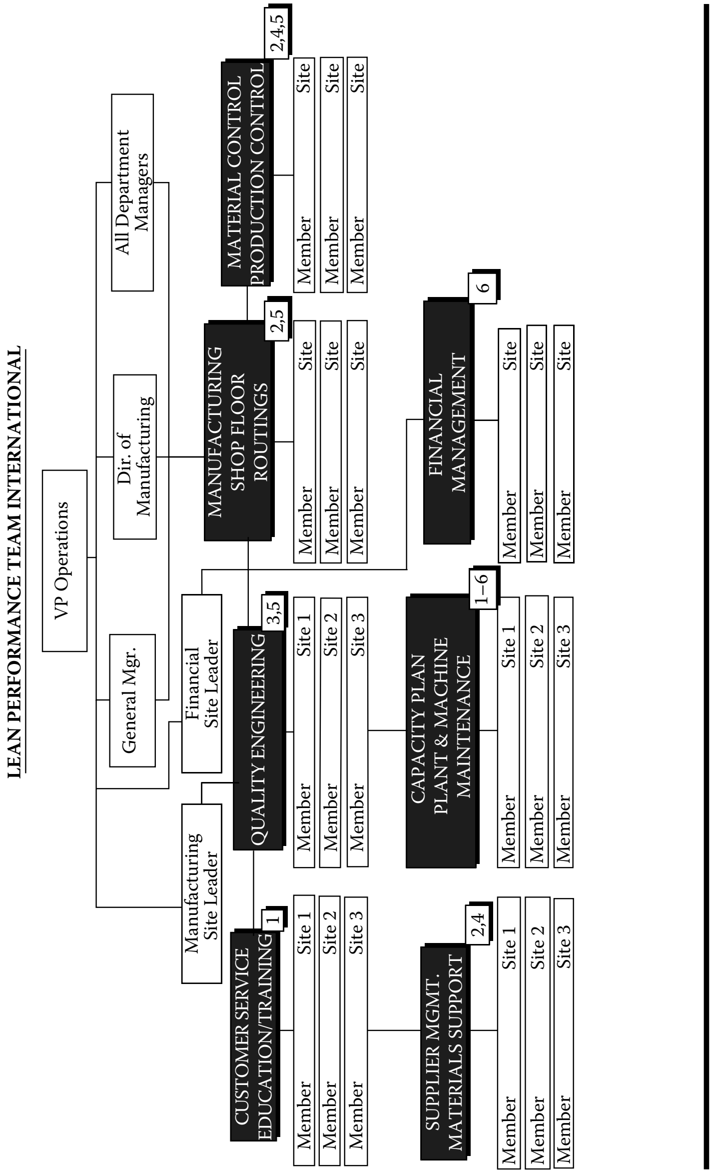


Figure 5.4 Lean Performance Team: International

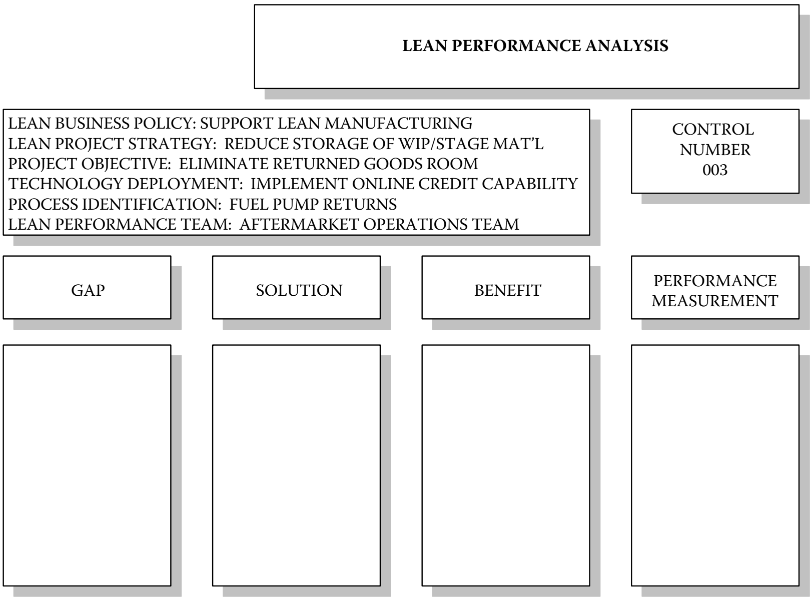


Figure 5.5 Lean Performance Analysis Process and Team Identified

PROCESS WORK FLOW DIAGRAM

PROCESS NAME:			SITE CODE:	INDEX NUMBER:
PROCESS DESCRIPTION:		OWNER:		CUSTOMER:
PAGE NUMBER: 1 OF 1	REVISION LEVEL:	DATE ISSUED:	DATE REVISED:	DATE PRINTED: 5/3/2007
INPUT		PROCESS		OUTPUT

Figure 5.6 Workflow Diagram Template

WORK INSTRUCTION

SCREEN NAME:			SITE CODE:	INDEX NUMBER:
PAGE NUMBER: 1 oF 1	REVISION LEVEL:	DATE ISSUED:	DATE REVISED:	DATE PRINTED: 5/3/2007

Figure 5.7 Work Instruction Template

Chapter 6

Steering a Lean Performance Project

Management in the Lean Performance Project

Management in any company, in any stage of development, enacts its responsibilities through a role-set, whether consciously selected or thrust on it by the prevailing situation and organization culture.

A role-set is a set of expected behaviors enacted by role players, formed over time by interactions between role players and the group, organization, or institution of which role players are members in response to tasks pursued by role players. Thus, managers can be viewed as role players. In fact, they play several roles as required (or as they perceive the role requirements).

A Lean Performance project is a project cycle to manage the implementation of lean principles, tools, and practices at the process, management, and organization levels of a company. A few examples of managerial roles in a Lean Performance project are:

- Advocate
- Champion
- Sponsor
- Communicator
- Motivator
- Team builder/team player

- Educator/developer
- Change agent
- Facilitator/coach/catalyst
- Mediator/negotiator

These are some of the many roles that managers, individually and as a group, can and are expected to play in a Lean Performance project. Common among these roles is their function as articulators of expectations. Most people respond to concrete examples and explanations, rather than to plans, policies, and procedures. Here's a closer look at the expectations for each role and suggested players:

Advocate

An advocate makes it clear that becoming lean is the direction the company should take. It is the role of supporter, played when the company is deciding whether to accept the challenge of becoming lean. (An example is the chairman of the board/directors.)

Champion

The magnitude of the challenge of becoming lean leads to the emergence of a champion, or champions: people who might be characterized as "leading the charge." The champion does more. He or she motivates, leads by example, and persuades with optimistic action. (Any and all directors and managers.)

Sponsor

Management provides legitimacy to the process of becoming lean and makes it possible by providing resources and authorizing or approving changes in methods, equipment, personnel, and processes. (Directors, managers, supervisors.)

Communicator

The communicator eliminates the tangle of barriers to communication caused by organization structure and specialization. She or he will establish new communication links and use them continuously to direct, inform, and motivate. These people will be the key communicators in the Lean Performance project. (Directors, managers, supervisors, administrative specialists.)

Motivator

Becoming lean ultimately requires an individual commitment to lean principles and practices; that is, to "thinking lean." However, this is not a self-initiated process for most individuals. Management must initiate and sustain the motivation needed to become lean through its leadership and its own commitment. Management must persuade all employees of the advantages of becoming lean and their part in the Lean Performance project. (Directors, managers, supervisors, foremen/forewomen, team leaders.)

Team Builder/Team Player

Working through committees and projects has become commonplace, but forming and sustaining Lean Performance teams is not so common. Lean Performance teams function at the task level, and at the change level in the company. It is not easy for most managers and employees to operate in this mode. Management must become the team builders and themselves be team players. (All personnel.)

Educator/Developer

Education and professional development in the workplace usually refers to individual education and development or career enhancement, not a united effort to change the company. Education in a Lean Performance project means acquiring the principles, tools, and practices that the Lean Performance project requires. Learning responsibilities and roles that each must play, management also has the task of educating itself and the rest of the organization in lean principles, tools, and practices. (Directors, managers, supervisors, foremen/forewomen, team leaders, education and training specialists.)

Change Agent

Whether, when, where, and how a change occurs is influenced by active change agent intervention. It would be a stretch to say change agents control the change process, even to say they manage it, although they may certainly try. This is true because the change process often results in unexpected consequences (i.e., "too many" or "too few" resignations for an early retirement option).

From a project perspective, changes are in large measure in the hands of the Lean Performance teams. In spite of all of these limitations, management must "make it happen." It has the role of orchestrating the change process, even to the point of changing players on the Lean Performance teams. (All personnel.)

Facilitator/Coach/Catalyst

Lean Performance teams need assistance and guidance to make changes. It is not enough to educate, empower, and encourage. Knowledge of and interest in the action on the field, and advice and solid direction when appropriate are required. Management must cause action without entering the action. As a facilitator, management draws out and helps the individual or team in pursuing objectives or solving problems. (Directors, managers, supervisors, foremen/forewomen, team leaders.)

Mediator/Negotiator

Conflicts, turf problems, and misunderstandings are inevitable while undergoing major, rapid, or sustained change. Stress and tension gradually build before exploding into polarized viewpoints. Optimistically, management can anticipate these situations, but, when not able to foresee them, then management must mediate or negotiate the conflict. A successful Lean Performance project is predicated on effective human resource management. It is basic to all of the preceding management responsibilities and roles, so all personnel should play these roles. Among other considerations that influence the *application* of these roles and responsibilities in a given firm are often-held but stunningly obsolete management assumptions regarding employees. Here are several of the most prevalent, and potentially most damaging to the process of becoming lean:

- Employees should not be empowered to participate in a project that enables them to propose commitments the company may want to make, because this is the role played by managers and supervisors.
- Employees are not stakeholders in the company.
- Employees are not expected to make major contributions to making improvements.
- Employees should focus on the jobs they are given. It's up to management to make improvements.
- Employees do not need education or training to solve problems or make improvements.
- Human resource management becomes problematic in a lean enterprise.
- The union does not want employees to participate in a Lean Performance project.
- We can carry out the key points of a Lean Performance project without employee involvement.

Before a management team undertakes a Lean Performance project, it must assess the extent to which it holds these obsolete concepts. Unless management is willing to discard them, there is little hope for a successful Lean Performance project. In short, lean human resource management begins with management's self-assessment and continues by adopting positive assumptions.

To begin to be successful, cast the eight obsolete assumptions positively and adopt them as expressions of the new lean culture that is being adopted:

- Empowering employees to participate in the Lean Performance project enables them to propose commitments the company may want to make, and this provides a forum for improvement.
- Employees *are* stakeholders in the company.
- Employees *are* expected to make major contributions to making improvements.
- Employees *should focus* on their processes, and *make improvements* in their processes.
- Employees *need* education and training to solve problems or make improvements.
- Human resource management *is essential* in a lean enterprise.
- The union *will support* employee participation in a Lean Performance project.
- We are successful in the Lean Performance project only with employee involvement.

Employees can and should participate by identifying, developing, and implementing process improvements based on lean principles, tools, and practices. Employees can and should participate by making continuous improvements in their processes. Employees can and should participate by upgrading current, and acquiring new, work-related skills. Employees can and should participate by contributing to their Lean Performance teams.

Becoming lean is no small accomplishment. It is the result of a major effort on the part of the *entire* organization, during which both teams and individuals make significant contributions that should not go unrecognized. At milestones there is also the need to celebrate with all individuals involved. These need not be big events and there is not a need for large monetary rewards. In fact, some companies do not give money at all.

The preceding may be established as "lean cultural practices" in your environment by conducting a management policy deployment activity. The Lean Performance Analysis introduced below specifies tasks and responsibilities for conducting Management Policy Deployment during the Lean Performance project.

Completing the Lean Performance Assessment

A Lean Performance Assessment is not about comparing the number of *kaizen* events your enterprise has conducted, either in total or relative to the other divisions in your overall enterprise. It's not about benchmarking competitors, either, because lean is about competing with yourself to get to process perfection. As you conduct your Lean Performance Assessment, ask how well you are doing—really doing—on your lean transformation, and ask how a Lean Performance ERP project can help your enterprise.

The Lean Performance Assessment is used to understand the factors that need to be considered to complete a successful Lean Performance project. The following is a survey tool that includes questions about the factors necessary to be successful. Administer this survey with the management team that will be (or is) implementing a Lean Performance project in your firm. At the conclusion of the survey, there will be a discussion about how to use the information collected to plan the Lean Performance project.

A Lean Performance project is a project cycle to manage the implementation of lean principles, tools, and practices at the strategic, organizational, and activity process levels of the enterprise.

The Lean Performance Assessment Checklist will give participants a comprehensive understanding of their firm's need for, opportunity to benefit from, and ability to undertake a Lean Performance project. It will also provide participants a means of obtaining prerequisite information in their firm to develop a Lean Performance project plan tailored to their firm.

To achieve the objectives, those responsible for the Lean Performance project in their firm should fill out the checklist, discuss points of disagreement, and reach a consensus where differences are significant.

An assessment is an evaluation, a weighing of the evidence necessary to make a decision, or to determine a course of action (in this case, a project plan). An assessment can also be the evaluation of an activity in progress. For example, to use objective measures to evaluate a lean transformation process already under way, you using clearly stated assessment criteria and quantitative results performance reporting.

The Lean Performance assessment will provide your company with the basis for determining the scope and feasibility of undertaking a Lean Performance project by determining the extent of your company's readiness to begin. The assessment, thoroughly administered and completed, will help your company decide whether or not to even begin the lean journey. It will help your company avoid "formula approaches" that treat all companies alike. As much as these assessment factors may seem like nothing more than common sense, they are all too often ignored. The results are lean transformations that are limited in scope, unnecessarily disruptive, and short-lived. Avoiding or at least minimizing, these and other negative consequences is well worth the time involved in an initial assessment.

Lean Performance Assessment

The Lean Performance Assessment Checklist will assist your management team in evaluating readiness to complete a successful Lean Performance project in five critical areas:

1. Lean Enterprise Future State
2. Company Readiness
3. Opportunity to Make Lean Applications
4. Company Capability to Become Lean
5. Transformation Constraints

Lean Enterprise Future State

1. How much and how often do we disappoint our customers?
   ____
   ____
   ____
2. Is there a system of measurement and metrics to monitor this?
   ____
   ____
   ____
3. How many quality defects did we catch internally?
   ____
   ____
   ____
4. How many were returned to us by our customers?
   ____
   ____
   ____
5. What did that cost in dollars?
   ____
   ____
   ____
6. What did that cost in lost customers?
   ____
   ____
   ____

7. Is there a system of measurements and metrics to monitor this loss?

____
____
____

8. How many deliveries (exact quantity ordered, exact product ordered, exact ship date promised) did we miss?

____
____
____

9. Is there a system of measurements and metrics to monitor this?

____
____
____

10. What is the current trend on quality, cost, and delivery?

____
____
____

11. What is the percentage of value-creating time versus nonvalue-creating time as documented in current Process Standards?

____
____
____

12. How wide is our current lean effort?

____
____
____

13. Have we expanded our lean initiative to the planning processes?

____
____
____

14. Are we removing impediments to lean, like rigid reliance on MRP-based schedule dispatching and cost transactions?

____
____
____

15. Have we expanded our lean initiative to the office?

____
____
____

16. Have we developed a plan to use the freed-up time, equipment, and space from our lean activities?

____
____
____

17. What new products, services, and markets are we targeting? If "lean means layoff" then there is no lean.

____
____
____

18. Do we use production smoothing practices to provide a balance between Customer TAKT (the rate at which our customer "pulls") and Operations TAKT (the rate at which our factory can produce in a lean flow)?

____
____
____

19. Do we provide the direct pull of customer orders to our customer-facing processes so visual kanban and other lean flow practices can "direct" the flow without printed schedules or expediting lists?

____
____
____

20. Is everything upstream from our customer-facing processes "pulled" by the requirements at the customer interface, including supplier requirements?

____
____
____

21. Does our product flow directly to the customer without transit through holding, distribution, or other MUDA collection points?

____
____
____

22. Is there a need to "stockpile" in our distribution channel due to seasonality?

____
____
____

23. Are these requirements part of our production smoothing process?

    ____
    ____
    ____

24. Are there any requirements to buffer WIP because of lumpy demand?

    ____
    ____
    ____

25. Are these buffers being smoothed, or are they static and often too high or too low?

    ____
    ____
    ____

26. Is our MRP generation capable of setting WIP buffers according to current Customer TAKT?

    ____
    ____
    ____

27. Are we able to employ two-level master scheduling to plan buffer and seasonal assembly or finished stocks?

    ____
    ____
    ____

28. Are distribution requirements planning orders being utilized to direct the flow of finished buffers?

    ____
    ____
    ____

29. Are Customer TAKT–driven buffer and replenishment orders planned and released to the customer-facing processes so that they flow along with current shipping orders?

    ____
    ____
    ____

30. Are buffer stock calculations performed with central data at appropriate BOM levels to cover forecast errors and capacity shortfalls?

    ____
    ____
    ____

31. Can any actions be taken to reduce buffers such as improving quality of an upstream operation, increasing capacity inflow of an upstream operation, or improving delivery speed of an upstream operation?

____

____

____

In Our Future Lean Enterprise

32. Will we sell the same products and services or new products and services?

____

____

____

33. Will we retain the same locations for production or move to new locations?

____

____

____

34. No matter what products or services we create or from what producing locations we operate, will we leverage the same supply chain, or will we need a new supplier and logistics base?

____

____

____

35. Lean is a growth strategy, because lean transformation fails if it causes improvement-based layoffs. Will we need to develop new customers to absorb our newfound capacity?

____

____

____

36. What and where is your job in your new lean enterprise?

____

____

____

Enterprise Lean Vision Elements (Add/Change to Fit Your Lean Enterprise)

37. With the help of all employees our lean enterprise will be a workplace where:

    ____

    ____

    ____

38. The Process Stream is known and understood by everyone.

    ____

    ____

    ____

39. Everyone's input on quality, cost, and delivery is considered while creating solutions.

    ____

    ____

    ____

40. Each member of the enterprise participates in the development of the work to be accomplished and how that work is to be accomplished.

    ____

    ____

    ____

41. Everyone is actively involved in the learning, implementation, and results of process design.

    ____

    ____

    ____

42. Our process operators are the people who are exactly what our Process Stream needs to flow quality with best cost and customer delivery.

    ____

    ____

    ____

43. Our process owners (managers and supervisors) are team members who facilitate in service of the work teams who directly provide customer value.

    ____

    ____

    ____

Our Process Owners (Managers and Supervisors)

44. Are available to "work with people," not to "make them work."

____

____

____

45. Have stopped giving orders and started giving direction.

____

____

____

46. Use their time in observation and identification of opportunities.

____

____

____

47. Share knowledge and create effective work relationships.

____

____

____

48. Provide coaching to assist and support the members of the organization and guide frequent progress assessments.

____

____

____

Company Readiness

1. Assess your company's need to become lean:

High	Low	Reasons (check as applicable)
☐ ☐	☐ ☐	To meet or beat the competition
☐ ☐	☐ ☐	To be able to reduce prices
☐ ☐	☐ ☐	To keep delivery promise dates
☐ ☐	☐ ☐	To reduce new product development cycle time
☐ ☐	☐ ☐	To improve quality
☐ ☐	☐ ☐	To implement a continuous improvement program
☐ ☐	☐ ☐	To respond faster to customer orders
☐ ☐	☐ ☐	To respond flexibly to customer orders
☐ ☐	☐ ☐	To reduce costs and improve operating efficiencies
☐ ☐	☐ ☐	To improve process design
☐ ☐	☐ ☐	To redesign processes
☐ ☐	☐ ☐	To improve process operations

☐☐ ☐☐ To reduce the workforce
☐☐ ☐☐ To improve production planning
☐☐ ☐☐ To develop a continuous flow process
☐☐ ☐☐ To develop a production pull process
☐☐ ☐☐ To improve production support processes
☐☐ ☐☐ To improve administrative processes
☐☐ ☐☐ To match or beat the competition

2. Identify your company's *current position* with respect to lean. Check closest position or positions to that of your firm.
   - ☐ General but limited knowledge of lean principles and practices. Think it may be useful in our plant. Want to learn more before trying it.
   - ☐ Have minimal knowledge of lean principles and practices but ready to get started. Will commit resources as required.
   - ☐ Have begun to get lean in selected areas but don't know how to move from a process to an organizational level.
   - ☐ Top management views lean as a shop-floor tool that does not require its involvement.
   - ☐ Are midway through a lean transformation in the plant.
   - ☐ Have experienced some problems of implementation.
   - ☐ Have experienced some differences of opinion with the union.
   - ☐ Expect to move into administrative and support processes.
   - ☐ Have completed a lean transformation in the plant.
   - ☐ Are now going through a lean transformation in administrative and support processes.
   - ☐ Management supports the use of lean principles and practices throughout the organization.

   Other/Comments

   ____
   ____
   ____

3. What other programs or approaches are you using or considering that impact the goals of lean thinking? Consider their impact on the Lean Performance project:
   - ☐ TQM
   - ☐ SPC
   - ☐ JIT
   - ☐ MRP/ERP
   - ☐ Computer-integrated manufacturing
   - ☐ Supply-chain management
   - ☐ SPC

Other/Comments

____

____

____

4. Assess the potential to apply or level of application of lean transformational principles in your firm:

High	Low	Reasons (Check as applicable)
☐☐	☐☐	Precisely specify value by product or family
☐☐	☐☐	Identify the value stream for each product or family
☐☐	☐☐	Make value flow without interruption
☐☐	☐☐	Let customer pull value from process owner
☐☐	☐☐	Continuously pursue perfection

Comments:

____

____

____

5. Assess the potential to apply the current level of application of lean diagnostic tools in your firm:

High	Low	Lean Diagnostic Tools (Check as applicable)
☐☐	☐☐	3 MUs
☐☐	☐☐	5 Ss
☐☐	☐☐	5 Ws and 1 H
☐☐	☐☐	4 Ms

Comments:

____

____

____

For a more detailed analysis on the presence of MUDA in the workplace, send teams out to visit the process areas. Return and answer the questions on the 3 MUs, 5 Ss, 5 Ws-1 H, and 4 Ms checklists presented earlier.

6. Assess the potential or current applications for the following lean tools and practices in your firm:

High	Low	Lean Tools and Practices (Check as applicable)
☐☐	☐☐	Cellular production
☐☐	☐☐	U-shaped cells
☐☐	☐☐	Cell design and layout for flow
☐☐	☐☐	Preventative maintenance
☐☐	☐☐	SMED (single-minute exchange of die)
☐☐	☐☐	Internal versus external setup
☐☐	☐☐	Station and operation process control

☐☐ ☐☐ Sending only what is needed
☐☐ ☐☐ Error proofing (poka-yoke)
☐☐ ☐☐ Work group/team error proofing
☐☐ ☐☐ ZD (zero defects)
☐☐ ☐☐ Cycle time
☐☐ ☐☐ TAKT time
☐☐ ☐☐ Kanbans
☐☐ ☐☐ Part conveyance between stations
☐☐ ☐☐ Mixed-flow lines
☐☐ ☐☐ Level loading
☐☐ ☐☐ Small-lot production
☐☐ ☐☐ Balanced flow
☐☐ ☐☐ One-piece flow
☐☐ ☐☐ Synchronous flow

Other/Comments:

____
____
____

Opportunity to Make Lean Applications

1. Assess the potential to apply or current application of value-added process analysis to your processes:

High Low Value-Added Process Analysis (Check as applicable)

☐☐ ☐☐ Analyzing sequential processes
☐☐ ☐☐ Time-based activity analysis
☐☐ ☐☐ Analyzing concurrent processes
☐☐ ☐☐ Analyzing organizational complexity
☐☐ ☐☐ Identifying value-added and nonvalue-added activities
☐☐ ☐☐ Identifying handoffs
☐☐ ☐☐ Analyzing work movement
☐☐ ☐☐ Assessing changeover times
☐☐ ☐☐ Assessing work in process
☐☐ ☐☐ Identifying problem imbalances
☐☐ ☐☐ Identifying process variability
☐☐ ☐☐ Analyzing defects and errors
☐☐ ☐☐ Analyzing process yields

Comments:

____
____
____

2. Assess your organization's potential to implement or actual results in implementing lean cross-functional processes:

High	Low	Cross-Functional Processes (Check as applicable)
☐☐	☐☐	Lean Quality Management
☐☐	☐☐	Lean Maintenance
☐☐	☐☐	Lean New Product Introduction
☐☐	☐☐	Lean Design and Engineering

3. Assess your organization's potential to implement or actual results in implementing lean cross-enterprise processes:

High	Low	Cross-Enterprise Processes (Check as applicable)
☐☐	☐☐	Lean Customer Relationship Management
☐☐	☐☐	Lean Sales and Operations Planning
☐☐	☐☐	Lean Supply-Chain Management

Comments:

____
____
____

4. Lean process improvements are possible in all company/enterprise processes. Assess the potential or current level of attainment of lean processes in the following process areas:

High	Low	Processes (Check as applicable)
☐☐	☐☐	Order Processing
☐☐	☐☐	Accounting
☐☐	☐☐	Customer Service
☐☐	☐☐	Warranty Processing
☐☐	☐☐	Mailroom Activities
☐☐	☐☐	Advertising
☐☐	☐☐	Human Resources

Comments:

____
____
____

Company Capability to Become Lean

1. Identify personnel who have leadership qualities, a willingness to make major changes in company operations, and the availability to participate in a Lean Performance project in your firm. The functions that these leaders would perform in the Lean Performance project include:

Project manager
Facilitator
Coordinator
Trainer
Process-area team leader

Name	*Department*	*Job Title*
______________	__________________	________________
______________	__________________	________________
______________	__________________	________________
______________	__________________	________________
______________	__________________	________________
______________	__________________	________________
______________	__________________	________________
______________	__________________	________________
______________	__________________	________________
______________	__________________	________________
______________	__________________	________________

2. Our experience in implementing organizational change may be characterized as (check all that apply):
   - ☐ No major organizational changes have been made to date.
   - ☐ We have only made small incremental changes.
   - ☐ We have made several changes in machinery, methods, product lines, processes, and organization.
   - ☐ Changes made are all within our current policies.
   - ☐ Changes made are not all within our current policies.
   - ☐ Changes made have had departmental impact.
   - ☐ Changes made have had organizational impact.
   - ☐ Changes made have had cross-functional impact.
   - ☐ We have made at least one major change in our operation that has been cross-functional in scope (i.e., TQM, ISO 9000, MRP/ERP, JIT).
   - ☐ We have been through a major merger that impacted the entire organization.

   Comments:
   ____
   ____
   ____

3. Identify your management's strong and weak characteristics that will facilitate or inhibit a Lean Performance project in your firm.

Strong	Weak	Management Characteristic
☐☐☐☐	☐☐☐☐	Innovative
☐☐☐☐	☐☐☐☐	Long-term vision

☐☐☐☐ ☐☐☐☐ Supports education and development
☐☐☐☐ ☐☐☐☐ Sustained effort once a program is under way
☐☐☐☐ ☐☐☐☐ Desire to benefit all stakeholders (employees, customers, suppliers, management, owners)
☐☐☐☐ ☐☐☐☐ Desire to be an industry leader
☐☐☐☐ ☐☐☐☐ Growth oriented
☐☐☐☐ ☐☐☐☐ Attention to detail
☐☐☐☐ ☐☐☐☐ Personal interest in improving operations
☐☐☐☐ ☐☐☐☐ Human resource skills

Other/Comments:

____

____

____

4. Assess the capacity of your management to play the roles necessary to complete a Lean Performance project.

High Low High Role (Check as applicable)

☐☐ ☐☐ Advocate
☐☐ ☐☐ Champion
☐☐ ☐☐ Sponsor
☐☐ ☐☐ Planning coordinator
☐☐ ☐☐ Communicator
☐☐ ☐☐ Motivator
☐☐ ☐☐ Team builder/player
☐☐ ☐☐ Educator/developer
☐☐ ☐☐ Change agent
☐☐ ☐☐ Facilitator/coach
☐☐ ☐☐ Cross-functional manager
☐☐ ☐☐ Process manager
☐☐ ☐☐ Mediator/negotiator

Other/Comments:

____

____

____

Lean Performance Project Constraints

1. Assess the extent to which your firm is characterized by the organizational consequences of a mass production system as the primary basis of structure and operation. This is a key issue because mass production systems, especially those in older, established industries, pose the greatest challenges to lean thinking. Precisely because they once were the most advanced manufacturing organizations and management systems, it is difficult to convince proponents of such systems that they are now industrial dinosaurs. Recognizing these dysfunctional systems and characters helps you to identify the scope and direction of your Lean Performance project. To assess the extent to which your firm is characterized by the organizational consequences of a mass production system as the primary basis of structure and operation, see which of the following characteristics are applicable:

High	Low	Characteristic
☐☐	☐☐	Command-and-control management systems.
☐☐	☐☐	A multilayered management hierarchy.
☐☐	☐☐	A departmental/job focus, not a focus on process/task.
☐☐	☐☐	Departmental objectives have priority over organization objectives.
☐☐	☐☐	An emphasis on the status quo, not on innovation.
☐☐	☐☐	Processes do not flow across departmental boundaries.
☐☐	☐☐	Innovation is focused on product but not on process development.
☐☐	☐☐	Systematic improvement is a staff activity, not a worker responsibility.
☐☐	☐☐	Quality standards are maintained, not improved.
☐☐	☐☐	Systems and operations processes are not documented.
☐☐	☐☐	Standard ways of operating are not established.
☐☐	☐☐	Performance measures are primarily financial, not operational or process.
☐☐	☐☐	Controls are maintained, not continuously improved.

Other/Comments:

____

____

____

2. Enthusiastic lean advocates often ignore resistance, only to wonder later on why lean fails to take hold in their company. Whether it is resistance or apathy, if resistance is not dealt with from the start and whenever and wherever it occurs, it will kill all chances of a successful Lean Performance project. Anticipate resistance and apathy to a Lean Performance project in many forms. We can anticipate *resistance or apathy* to a Lean Performance project in our firm from the following sources:

   Top management

   ____
   ____
   ____

   Middle management

   ____
   ____
   ____

   Supervision

   ____
   ____
   ____

   Production support processes

   ____
   ____
   ____

   Administrative processes

   ____
   ____
   ____

   Professional staff

   ____
   ____
   ____

   Professional personnel

   ____
   ____
   ____

Administrative personnel

Union

____
____
____

Non-union

____
____
____

Production personnel

Union

____
____
____

Non-union

____
____
____

3. The *key issues and problems* in our company facing the Lean Performance project are:
   - ☐ What to do with excess personnel
   - ☐ How to work with the union
   - ☐ How to overcome resistance and apathy in the workforce
   - ☐ How to gain the confidence and trust of the skeptical
   - ☐ How to determine the size of the one “key layoff” if made
   - ☐ What to do about a key manager who is openly hostile
   - ☐ How to pace our transformation effort over time to sustain effort
   - ☐ How to get lean thinking internalized
   - ☐ How to move past “low-hanging fruit” and motivate personnel to tackle less obvious problems and opportunities
   - ☐ Developing Lean Performance teams
   - ☐ Resolving conflicts between process areas
   - ☐ How to get the support of the IT group

   Other/Comments:

   ____
   ____
   ____

Analyzing Lean Performance Assessment Results

In the Lean Assessment, the enterprise learns about itself. Some questions require research. Other questions seem too difficult to answer. For some, the answer is negative. That lean tool or practice is not in place today. Much work needs to be done before we know who it is we would like to become. Keep considering the questions until the answers are in place. The current enterprise will benefit from the attention given to obtaining and implementing the answers. When the answers to the Lean Enterprise Future State questions are known, you will have enough information to proceed with the rest of the Lean Performance Assessment. Complete the Lean Vision statement and proceed.

In the category of company readiness, if company general management does not perceive a need to become lean, does not understand the nature and scope of a Lean Performance project, or is expanding major effort on programs that are incompatible with lean thinking (i.e., TQM, ISO 9000, outsourcing, etc.), then a Lean Performance project should not be undertaken at this time. Instead, more education on lean thinking is in order and the major task, say a merger or acquisition or other, should be completed first.

You should utilize the Lean Performance Assessment to assess opportunities to apply lean principles, tools, and practices in your firm. This is important in order to focus the Lean Performance project on the most productive combinations of Lean applications and receptive areas and to determine what types of additional education or training would be most beneficial. Finally you need to gauge the scope and depth of the Lean Performance project that can be undertaken.

Where is your firm successful in applying lean tools and practices? Where are the opportunities to apply lean principles, tools, and practices? Readiness and opportunity are not enough to ensure an effective Lean Performance project. There must be a management capability in place to direct and implement the project, with the collective skills, abilities, and, above all, willingness to accept the challenges and responsibilities that becoming lean entails. Management must be scrupulously honest in assessing its collective capabilities to implement lean thinking. If management cannot ensure a "critical minimum effort," the project is better reconsidered for a later date. This, of course, is with the understanding that what seems optional today is all too often mandatory tomorrow, and later should only be a matter of months.

Can management ensure the "critical minimum effort" or should the project be reconsidered at a later date? Now consider the major factors that can constrain the Lean Performance project, even to the point of torpedoing it entirely, the legacies of a mass production system:

- Rigid organizational structures
- Inflexible thinking
- Autocratic management

Any remaining legacies of your mass production system? Rigid structures? Inflexible thinking? Autocratic management? Legacy issues may necessitate shutting down, breaking up, spinning out, and selling off assets where lean thinking is not probable to take root. Hopefully, this is not the case and a small entry point can be found to initiate lean thinking. Anything to shut down? Break up? Spin out? Sell off?

Two other factors in their most virulent form may preclude a Lean Performance project, hopefully not permanently. These are resistance and apathy, which produce an unmanageable number of "cementheads" and an intransigent union. When you answer the assessment, consider truthfully whether or not your company contains such "cementheads" or an intransigent union. Either problem must be addressed prior to beginning a project.

In conclusion, a thoughtful consideration of the assessment factors will have well served its purpose if it has caused your management team to assess the possibilities for a successful Lean Performance project. It also will help you to plan and manage a Lean Performance project that is truly based on your company's unique configuration of objectives and resources to achieve those objectives.

Preparing for the Lean Performance Project

To determine if your firm can, should, and is willing to begin a lean transformation, or to extend already existing lean practices across the enterprise by initiating a Lean Performance project, appoint a leader or champion and develop a support group to initially coordinate the wider effort. Allow an initial trial period of 6 to 12 weeks. Select initial processes that are *not* controversial. The emphasis of the trial is on gaining lean experience at the team *and* management levels in order to determine if your firm can, should, and is willing to begin a lean transformation.

Focus on one process area (usually production) throughout this trial phase. Acquire a basic education in lean principles, tools, and practices for managers and supervisors. Develop two or three Lean Performance teams to work on unrelated products and processes in order to gain a wider experience base. Identify several potential processes to improve. Give all team members training in the use of lean principles, tools, and practices and have an experienced lean team facilitator work with the initial teams. Be sure to initiate weekly team meetings on company time, and hold interteam meetings at least every month. Have teams present results and proposed changes, and develop a management process and membership to approve (if warranted) the proposed change. Implement the proposed changes through a developing management process that can monitor results and measure improvement. Continue to provide assistance (training, facilitating, in-house expertise) as required to the teams. It may be desirable to expand the activity by using Lean Performance teams to complete tasks in data accuracy, inventory reduction, and quality. Continue for 6 to 12 weeks, and be sure to document all significant activities and improvements. It is better to have less experience that is well documented than a lot of hastily conceived and executed experience that is undocumented.

After 6 to 12 weeks, reassess your firm to consider the issues present in a Lean Performance project. Review and evaluate your results to date. Decide to stop, or continue to gather more experience and information, or expand Lean Performance to include a formal project organization. If you are ready to begin, read on.

LEAN PERFORMANCE PLANNING MODULES

II

There are two objectives for Lean Performance Planning:

1. To develop a plan for the Lean Performance project based on your firm's need, opportunity, and capability to develop unique company attributes.
2. To understand how planning can be useful to integrate lean processes throughout the transition to Lean Performance management.

Planning for Lean Performance differs from traditional corporate planning. Initial project plans cannot be based on past experience with lean transformation, because there isn't any. Experience in lean thinking must be acquired *before* a valid planning process can be undertaken. This is essential because lean thinking runs counter to the basic assumptions of mass production on which current manufacturing planning practices are based, so most nonlean firms aren't in the lean thinking mindset, and even lean firms, as we discussed above, are generally not lean in the management decision and information/support processes.

A Lean Performance project plan must be designed and implemented based on the unique lean vision–driven configuration of your firm's organization, processes, technology, and culture. It must be derived from the foundational premise that all of these will change before the project is completed. Planning is necessary to facilitate the impact of changes in essential processes. Previous organizational planning did not require these considerations, because while planning organizational structural changes, and perhaps personnel requirements, prior planning assumed no significant *process* changes.

Unless Toyota is just an anomaly, Lean Production is going to replace mass production in the global supply chain(s), and sooner rather than later. Why? Lean will win because lean delivers better quality (Q), at a lower cost (C), in a shorter time (D). The better idea wins in free market competition. Remember, if Lean Production works for Toyota, and it doesn't work for you—it's you.

Identify your progress toward lean. Is it formalized? Is it budgeted? Is it enterprisewide? Is it sustaining? Or is it gasping for survival? Is it "the latest failure"?

Lean transformation is a process worthy of formalization. Right now, make it formal. Budget it. Make it enterprisewide. Develop a sustaining construct for lean by starting a Lean Project Office today and staffing it with your best and brightest "leanies." Create the HR mechanisms that will allow for transfers of capable personnel to staff lean initiatives as resource people. Pick a "volunteer" to be the lean transformation project manager. Take all of his or her other assignments away. By the way, the best and brightest are already competing to join the lean firms and those firms that are becoming lean. They can see where this is going, from a career perspective. And, of course, that just makes the lean firms stronger and the remaining mass firms weaker. Don't be left behind. Do it now.

It is up to the lean sponsors and champions to make the management commitment to lead and manage a lean transformation. If not the lean sponsors and champions, then who will develop a formal project, with dedicated personnel?

Even if, in the early stages, planning for the Lean Performance project may seem unimportant, the benefits obtained from good project planning will be evident as the project proceeds. The Lean Performance project methodology begins with a management project planning process that includes the deployment of management policies and strategies downward into the business.

Chapter 7

Deploying Management Policy Module

Management Tasks

Organizing the Steering Committee

Forming a Lean Steering Committee will demonstrate your commitment of time to formalize the lean effort and will also help to get lean on the schedule. Taking this one critical step will empower Lean Champions throughout the enterprise.

The Lean Steering Committee should be a nontraditional group. Include the visible lean sponsors from business units, Lean Champions from key process areas, and the lean project manager. Be sure to include human resources and finance. Expand it later, when you know more.

The first task for the Lean Steering Committee is to conduct a lean assessment of the enterprise. The second task for the steering committee is to develop the lean implementation project plan, which must include an education plan.

When it comes time to introduce the coming lean transformation, don't make too much noise prematurely. Although *kaizen* activities may demonstrate early returns and should be performed on a pilot basis early in the planning stage of a Lean Performance project, as employees become enthusiastic about the gains made between present and target conditions they must be effectively informed about the extent of the desired lean transformation and the plan to accomplish it.

It is important to be proactive in presenting "why" the coming lean transformation is important to the employees. Part of that requirement is conducting a lean assessment. Get past the assumption that process owners and operators don't need to know the "business case" for lean transformation. Many of them already know all about the QCD competition coming from offshore. While educating about the "how to" of lean practices such as changeover reduction or kanban, be sure that the business objectives that drive lean such as inventory reduction, inventory turns, short lead-times, elimination of waste, and the concepts of value added, just in time, and make to order are all well understood and accepted by employees so they recognize the efforts of the company to survive and thrive through the lean transformation.

Education that can be provided in the workplace should be provided in the workplace. Establish "local" areas for education and workshop sessions, with a large conference table, a full-size dry-erase board, and portable dry-erase boards. Combine sessions on the practices of pull, kanbans, changeover reduction, TPM, eliminating MUDA, etc., along with *kaizen* events to attack a particular problem. The end result will be that the process owners and operators will understand the principles behind what they are implementing. They will know that they are implementing lean practices in order to provide a consistent lean flow of products and services to their customers.

Educated process operators will be knowledgeable enough to spot inconsistencies between what management says and what management does. They will quickly point out gaps in the lean implementation. When standardized work and other lean practices are implemented by the process operators who actually do the work, they tend to succeed. When the process owners and operators understand "why," they focus on solutions that achieve the objectives of the company.

The first element of the planning process is forming the project steering committee. The steering committee is an expansion of the existing lean support group or, if a support group is not in place, the key individuals in the business as well as a Lean Performance project manager and a business "owner" from all process areas in a single-site project or each project site in a multisite project.

Management personnel who were identified during the Lean Performance Assessment as capable of playing the various roles needed within the lean transformation project are appropriate individuals for steering committee responsibilities:

- Advocate
- Champion
- Sponsor
- Communicator
- Motivator
- Team builder/team player
- Educator/developer
- Change agent

- Mediator/negotiator
- Facilitator/coach/catalyst

The management personnel who were identified for these roles during the Lean Performance Assessment should be called on now to assist in the development of Lean Project Strategies. Prior to the formal deployment of Lean Business Policies and strategies at the project inception, roles should be formalized and a steering committee introduced.

Confirming the Lean Vision

A company's vision is its desired future state (i.e., what it hopes to become). The company Lean Vision must incorporate the breadth and depth of the Lean Performance project. The Lean Vision determined during the Lean Performance Assessment should now be formalized and published.

Identifying and Deploying Lean Business Policies

Lean Business Policies express the views of the lean sponsor or champion of the Lean Performance project. Typically, this is the chairman or CEO of the business. Lean Business Policies define the lean business mission. Lean Business Policies drive the development of lean project strategies. Lean business policies are often expressed by executive management in business plans that are delivered to the business organizational level or in existing company policy communications vehicles such as business plans and strategic planning documents, including the previously mentioned Lean Vision Statement. The project sponsor/champion should also incorporate the lean business policies developed during the Lean Performance Assessment. Figure 7.1 illustrates a sampling of Lean Business Policies. We will track the deployment and eventual project/process team implementation of these Lean Business Policies throughout the project text that follows.

In the Lean Performance methodology, Lean Business Policies are formalized and deployed to the organization and eventual project team through use of a deployment practice called the Lean Performance Analysis. Figure 7.2 illustrates the Lean Performance Analysis template. Each topic on the template must be completed for any project issue requiring steering committee approval of a system modification. As previously stated, Lean Performance is a project methodology designed to facilitate an unmodified implementation of the underlying software enabler or enablers.

The lean sponsor or champion completes the Lean Business Policy portion of the Lean Performance Analysis templates, one policy per form. These Lean Performance Analysis masters are numbered and distributed for review and identification of Lean Business Strategies by the members of the project steering committee.

LEAN BUSINESS POLICIES

- Example Lean Business Policies:
  - Support Lean Manufacturing
  - Support Lean Thinking in the Global Standardization of Engineering Processes
  - Support Lean Thinking in the Global Standardiazation of Financial Processes
  - Support Lean Thinking in the Global Standardization of Information Systems Management

Figure 7.1 Lean Business Policies

Identifying and Deploying Lean Project Strategies

Lean Business Policies pertaining to the Lean Performance project that have been identified and articulated will now be disseminated, understood, and followed throughout the project. They will in other words be *deployed* to the process level.

A company's policy-driven strategies are the guidelines within which it operates in pursuing and fulfilling its lean mission. Following the Lean Business Policies deployed by the lean champion or project sponsor, members of the emerging project steering committee communicate lean strategies that they would like to see pursued in their business organization or process areas.

To identify Lean Project Strategies, steering committee members and key business unit, divisional, and section managers interpret Lean Business Policies that are likely to impact or be impacted by process requirements. Incorporating their specific

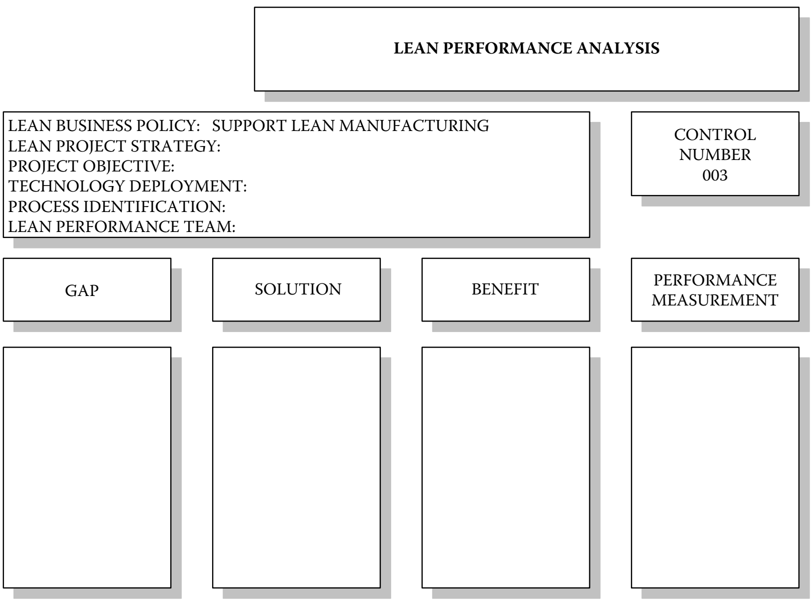


Figure 7.2 Lean Performance Analysis—Lean Business Policy Deployed

knowledge of business and technology trends and developments and the lean policy requirements in their respective areas, the improvement project is directed toward specific attainable benefits.

Discussions should also be held with actual and potential steering committee members to identify additional Lean Strategies for project deployment. Lean strategies are also derived from the results of the Lean Performance assessment. Figure 7.3 illustrates examples of Lean Project Strategies.

Lean Project Strategies for the Lean Business Policy to *support lean manufacturing* used as examples throughout the book include:

- Reduce manufacturing lead-time
- Reduce manufacturing inventory
- Implement flexibility for low-volume products
- Implement supplier partnerships and certification
- Implement activity-based costing
- Implement process-integrated document tools
- Implement process-integrated bar coding

Lean Project Strategies for the Lean Business Policy to *support lean thinking in the global standardization of engineering processes* used as examples include:

- Design and utilize concurrent engineering processes
- Provide a standard software format for engineering product data management

Lean Project Strategies for the Lean Business Policy to *support lean thinking in the global standardization of financial processes* used as examples include:

- Implement central cash management
- Implement centralized integrated processing of period financial closings with local "soft closes"
- Implement centralized integrated data support, processing, and monitoring of the business plan

Lean Project Strategies for the Lean Business Policy to *support lean thinking in the global standardization of information systems management* used as examples include:

- Implement global standard hardware and software
- Implement global IT processes and organization

The Lean Project Strategies are deployed to the organization for review and development of project objectives through the further use of the Lean Performance Analysis masters.

LEAN PROJECT STRATEGIES

- Lean Project Strategies for the Lean Business Policy Support Lean Manufacturing Include:
  - – Reduce manufacturing lead time
  - – Reduce manufacturing inventory
  - – Implement flexibility for low volume products
  - – Implement supplier partnerships and certification
  - – Implement activity based costing.
  - – Implement process integrated document tools
  - – Implement process integrated bar coding

Figure 7.3a

LEAN PROJECT STRATEGIES

- Lean Project Strategies for the Lean Business Policy Support Lean Thinking in the Global Standardization of Engineering Processes Include:
  - – Design and utilize concurrent engineering processes
  - – Provide a standard software format for engineering product data management

Figure 7.3b.

LEAN PROJECT STRATEGIES

- Lean Project Strategies for the Lean Business Policy Support Lean Thinking in the Global Standardization of Financial Processes Include:
  - – Implement central cash management.
  - – Implement centralized integrated processing of period financial closing with local "soft closes."
  - – Implement centralized integrated data support, processing and monitoring of the Business Plan

Figure 7.3c

LEAN PROJECT STRATEGIES

- Lean Project Strategies for the Lean Business Policy Support Lean Thinking in the Global Standardization of Information Systems Management Include:
  - – Implement global standard hardware and software
  - – Implement global information technology processes and organization

Figure 7.3d Lean Project Strategies

To deploy lean policies and strategies for use in the development of project objectives, distribute a Lean Project Strategies Lean Performance Analysis, numbering one master for each lean business policy/lean project strategy combination. An example is included as Figure 7.4.

Defining the Project Mission

Lean project strategies also define the project mission. The project mission is its purpose, its reason for existence. When completed, the project should result in fulfillment of the mission. Management is responsible for seeing that the Lean Performance Project Mission Statement articulates the lean dimensions of its mission as incorporated in the Lean Project Strategies.

It is important for the Project Mission to recognize and state the project boundaries. Looking at the process redesign and system design methodologies critiqued earlier, we can see the fundamental differences. For example, a reengineering mission statement would define the future state of the business structure and key business structures:

- Corporate structure or ownership
- Corporate mission
- Products or services
- Markets

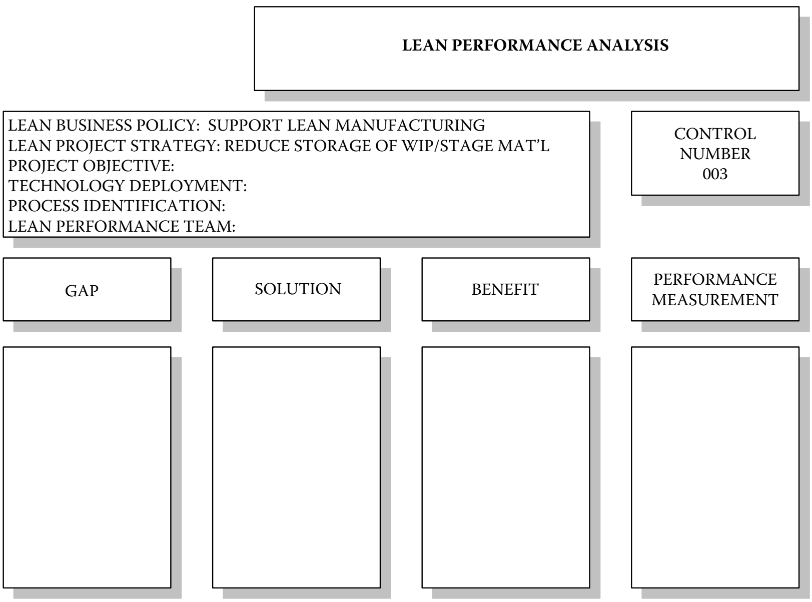


Figure 7.4 Lean Performance Analysis—Lean Project Strategy Deployed

- Core business processes
- People
- Buildings
- Machinery

A process innovation project has a different mission. A process innovation mission statement would define:

- Process goals or measurements driving the requirement for innovated processes
- The process selected for innovation
- The key business elements of the process selected for innovation, including people, buildings, and machinery

Finally, a systems approach mission statement would define:

- The system hardware and software future state
- Key business elements of the process areas selected for improvement, including business goals or measurements driving the requirement for redesigned processes as well as the process areas installing new system enablers

A Lean Performance project Mission Statement both combines and simplifies the mission in comparison to the former methodologies. It must define:

- Business policies and strategies driving the requirement for improved processes
- Process areas of concentration
- The system enablers' future state

An example is included as Figure 7.5.

Defining the Project Scope

The project scope defines the project boundaries within which the Lean Performance project team is empowered to (reasonably) conduct its process improvement activities free from interference. The project scope includes a feedback loop and review process for the steering committee. Figure 7.6 illustrates an example of an effective Project Scope Statement.

PROJECT MISSION STATEMENT

- "The Mission of the Lean Performance Project Team is to implement standard management decision and information processes utilizing unmodified package software. These improved processes must deploy management policy and facilitate process performance measurement and continuous improvement in the manufacturing information/support processes."

Figure 7.5 Project Mission Statement

PROJECT SCOPE STATEMENT

- "The Scope of the Lean Performance Project is:
  - To design and implement improved processes that deploy defined lean policies, strategies and objectives utilizing the project software
  - To operate within the budgets, schedules, and methodology approved by the Steering Committee
  - To report project progress, status and issues to the Steering Committee."

Figure 7.6 Project Scope Statement

Setting Up the Project Organization

During the year or more that it may take to complete a Lean Performance project, there must be an organization charged with the responsibility and appropriate authority to manage and execute project tasks. The following positions and teams are needed:

- A project manager
- A facilitator
- A training coordinator
- Lean Performance process-area team leaders
- Lean Performance process-area teams
- Site leaders for all sites (multisite projects)
- Lean Performance cross-functional teams
- Lean Performance cross-enterprise teams

The steering committee should establish the Lean Performance project organization as soon as the initial Lean Performance teams begin to generate a "critical mass" of activities requiring a project structure. This will become necessary fairly rapidly to coordinate activities in all business process areas as well as to develop, train, and monitor teams and their activities and communication between company management, project management, and the various Lean Performance teams.

Why a project organization structure? Perhaps the most important reason is that management responsibilities will increase as the Lean Performance project expands across all processes in the enterprise. Each subsequent lean improvement cycle will involve increasingly complex business processes. The pace of change will increase as the Lean Performance project expands, and more and more personnel will be involved. Team personnel and responsibilities will change occasionally, and decisions will be required about new assignments and priorities. Finally, the Lean Performance project time horizon will lengthen if the activity is not well planned and managed, and the longer the Lean Performance project takes, the less likely it is that it will succeed.

The Lean Performance project manager could be the leader/advocate designated during the assessment, or another capable and qualified person, but it should never be an external person. The most important duties of the project manager are to report to the steering committee on the progress of process improvements, including specific measures of cost, quality, and delivery or cycle improvements. The project manager must have the authority to request further action by teams through process-area team leaders, as well as to send and review issues with the steering committee, where project results are presented to management in periodic steering committee meetings. The project manager also conducts regular (at least weekly) project team meetings.

The Lean Performance project facilitator at first could be an external person, but ASAP should be a trained employee. The primary responsibility of the project facilitator is to lead project meetings, including visioning sessions and process lean improvement sessions.

The Lean Performance project training coordinator is a person trained and experienced in using lean principles, tools, and practices. The project may have to use an external person at first, but the steering committee should select a candidate early in project formation to pursue this (and only this) role.

A Lean Performance project process area team leader will be needed for each process area identified in the enterprise. The primary responsibilities of the process-area team leader are to ensure that a team is appointed in each area, to verify that all processes in the area are identified, and to ensure that all other process teams working in other process areas are linked to each area. They are also required to monitor team attitude and performance, including monitoring bargaining unit reaction where applicable and the level of project acceptance or resistance. Process-area team leaders will continuously update the network or Web-based project management tools, such as the process listing, for their areas.

Lean Performance project process area teams are groups of four to seven persons in a given process area including managers or supervisors, area specialists, and technicians involved in process design and operation. Process owners and operators must be included on the team. Process areas are defined early by the emerging project team. Each process area requires a process team.

Site leaders for all sites (multisite projects) are in essence project managers for each site and are responsible for coordinating the activities at the sites. Site leaders ensure that project communications are properly handled and project reporting is up to date. They nominally report to the project manager, but it is not a full-time position. Site leaders may also be needed for site-level facilitation and training, depending on the organization.

Lean Performance project cross-functional teams are groups of six to ten persons from two or more process areas responsible for boundary spanning processes and interaction. Again, in addition to managers and supervisors, specialists, and technicians, workers must be included from all participating process areas. Cross-functional teams emerge after processes are improved at the organizational process level. I will discuss the activities of several example teams below.

Lean Performance project cross-enterprise teams are groups of six to ten persons from two or more enterprise areas responsible for a company boundary spanning process. Again, in addition to managers, specialists, and technicians, workers must be included from all participating process areas. Cross-enterprise teams emerge after processes are improved at the cross-functional process level. I will discuss an example of this type of team, the Lean Commerce team, below.

Most Lean Performance projects can be handled with this basic structure. Depending on the size of the company, the specialization of the current company organization, and the tasks encountered during improvement and implementation of processes, additional implementation teams will need to be established prior to process implementation in order to assign tasks to an existing department (i.e., training and quality) and to develop ad hoc teams for tasks as they arise.

The steering committee should identify candidates for the project positions by conducting the assessment. Management policy and strategy deployment Lean Performance analysis masters should be deployed to the organization and project objectives established prior to formalizing and publishing a Lean Performance team organization chart, although it is desirable to assign a project manager to manage the formalization of project objectives.

The project organization chart should be published by the team during the team development and project management activities performed early in the project itself. An example is included in the Managing Project Module below.

Identifying and Deploying the Project Objectives

Lean Project Strategies must be communicated to project teams to be effective drivers for lean change. In order to be communicated in project terms and to be useful, lean policies and strategies must be translated into meaningful terms at progressively lower levels of the organization.

Project objectives are the actual identifiable, measurable, and quantifiable deliverables that the Lean Performance project is going to accomplish in support of deployed lean policies and strategies of the organization. Project objectives must be achievable by process owners by utilizing available project information technologies (i.e., no “missions impossible”). They must be tangible (recognizable) extensions at the process activity level of the Lean Business Policies and Lean Project Strategies deployed by the steering committee. Project objectives must be measurable. The requirement to be measurable dictates that the objectives must be attained at process levels, and those processes must have standards to utilize for measurement. They also must be realistic. For instance, it is unrealistic to deploy a project objective that requests a 10 percent cycle time reduction in a process where further reductions are not possible due to machine speed limitations. The inclusion of project team members from the process owner, operator, and customer ranks will mitigate against this particular brand of “mission impossible.”

To determine project objectives, distribute the Lean Performance Analysis masters with Lean Business Policies/lean Project Strategies portion completed. Provide a copy of each master for each person involved in this task. Although the core membership of this group is the steering committee members and other management role players identified in the assessment, the group should also include identified process owners and operators in the organization (i.e., the emerging project team). The emerging project teams at each project site should take a plant tour to observe current material flow, inventory support, existing machine centers, work cells, and NC equipment, etc. The teams should also determine opportunities and plans for manufacturing systems, process simplification, and work cell integration. Have these prospective team members interview key management personnel in each location to gain a clear understanding of current manufacturing systems capabilities, key information/support processes, and personnel assignments. Next, determine the need for the level of support of manufacturing systems in each process area of the company. Identify and include department managers in each of these critical areas:

- Finance
- Customer Relationship Management
- Maintenance
- Information Systems Support
- Operations
- Engineering
- Materials
- Marketing and Sales

In your discussions, determine the current elements and the existing capabilities of manufacturing support systems. Investigate the following:

- CAD/CAM
- FMS and Work Cell
- Group Technology

- AGV/ASRS
- Factory Data Collection and Communications
- Bar Coding

Finally, review the existing manufacturing planning and control systems to determine the extent to which information integration can be achieved. Link the project objectives to the Lean Business Policies and Strategies by deploying each suggested objective to the appropriate Lean Performance analysis master containing the relevant Lean Business Policy/Lean Project Strategy that supports deployment and attainment of that particular project objective. Obviously, if you can't link an objective to a Lean Business Policy/Lean Project Objective, it will be difficult or impossible to gain support for the project to include that objective. Some examples:

- For the Lean Project Strategy to *reduce manufacturing lead-time,* project objectives might include:
  - Implement 24-hour turnaround of customer orders
- For the Lean Project Strategy to *reduce manufacturing inventory,* project objectives might include:
  - Eliminate returned goods storeroom
  - Implement "pull" supplier management practices, including standard container quantity recognition with use of standard container quantities
- For the Lean Project Strategy to *implement flexibility for low-volume products,* project objectives might include:
  - Implement manufacturing line sequencing with ability to sequence models and variations on nondedicated lines as well as on dedicated lines
  - Implement multiplant sourcing of finished goods
  - Implement EDI/XML/SOAP or another e-commerce solution for interplant order management
- For the Lean Project Strategy to *implement supplier partnerships and certification,* project objectives might include:
  - Implement a pay-on-receipt process for vendors
- For the lean Project Strategy to *implement activity-based costing,* project objectives might include:
  - Establish product target costing/MUDA-free product target costs
- For the Lean Project Strategy to *implement process integrated document tools,* project objectives might include:
  - Implement bar coding for plant documents:
    - To scan shipments before loading
    - To confirm shipments
    - To print part numbers on manufacturing orders
    - To print manufacturing order pick lists

- For the Lean Project Strategy to *implement process-integrated bar coding,* project objectives might include:
  - Implement bar coding for customer requirements:
    - To process shipments
    - To scan shipping charges
    - To produce customer labels
    - For filled order items
- For the Lean Project Strategy to *design and utilize concurrent engineering processes,* project objectives might include:
  - Provide access to engineering product data at the manufacturing sites
- For the Lean Project Strategy to *provide a standard software format for engineering product data management*, project objectives might include:
  - Implement a standard software package for engineering product data management
- For the lean Project Strategy to *implement central cash management,* project objectives might include:
  - Determine and accommodate financial requirements of Canada, Europe (EU, VAT), and Asia
  - Include currency considerations such as a database by currency, strategy to realize currency conversion rate gain/loss, and base default account structures
- For the Lean Project Strategy to *implement centralized integrated processing of period financial closings with local "soft closes,"* project objectives might include:
  - Consolidate regional financial statements by business segment, product line, product, customer, product group, plant sales, gross profits, and shipments
  - Consolidate global financial statements by region, product group, and product line
  - Include by year, quarter, month, or month to date in period reporting structure
  - Include global sales, global margins, and global trends
- For the Lean Project Strategy to *implement centralized integrated data support, processing, and monitoring of the business plan*, project objectives might include:
  - Develop global standard reporting formats
  - Monitor, evaluate, and report product line and manufacturing site profitability
  - Develop period-to-date reporting, including regional sales, margins, and trends
- For the Lean Project Strategy to *implement global standard hardware and software,* project objectives might include:
  - Implement unmodified software packages

  - Leverage vendor-supplied software upgrades
- For the Lean Project Strategy to *implement global IT processes and organization*, project objectives might include:
  - Implement secure data and operations processes in a system that is seamless to the users
  - Implement standards for information systems uptime and reliability and measure and report performance to those standards

For each completed lean project strategies Lean Performance Analysis master, the project manager completes a project objective Lean Performance Analysis master, one for each project objective deployed below a Lean Project Strategy. This Lean Performance analysis deployment practice links lean business policies, lean project strategies, and project objectives to direct the teams and provides the basis for decisions about any desired software modifications later.

The Lean Performance Analysis deployment practice also links management to eventual performance measurements to monitor the performance of the new lean processes that result from the project. These Lean Performance Analysis masters are then deployed to the full project team at the first full training meeting of the team. The team will complete the information needed on the Lean Performance Analysis masters to deploy the policies to the process level. Technology deployment is completed by the information team, and process identification is performed by each process area team to deploy objectives to its processes and link the process where deployed policy will be realized by any team realizing or implementing objectives. An example is included as Figure 7.7.

Employing the Lean Performance methodology, these project objectives will be achieved by completing a number of project tasks:

- Identifying the business processes
- Developing Process Standards (process workflows and work instructions)
- Completing the Lean Performance Analysis
- Developing lean improvements
- Implementing improved processes
- Measuring and managing Continuous Lean Performance

Conducting Steering Committee Meetings

At the first steering committee meeting, review the following project management tools:

- Figure 7.1: Lean Business Policies
- Figure 7.2: Lean Performance Analysis—Lean Business Policy Deployed
- Figure 7.3: Lean Project Strategies

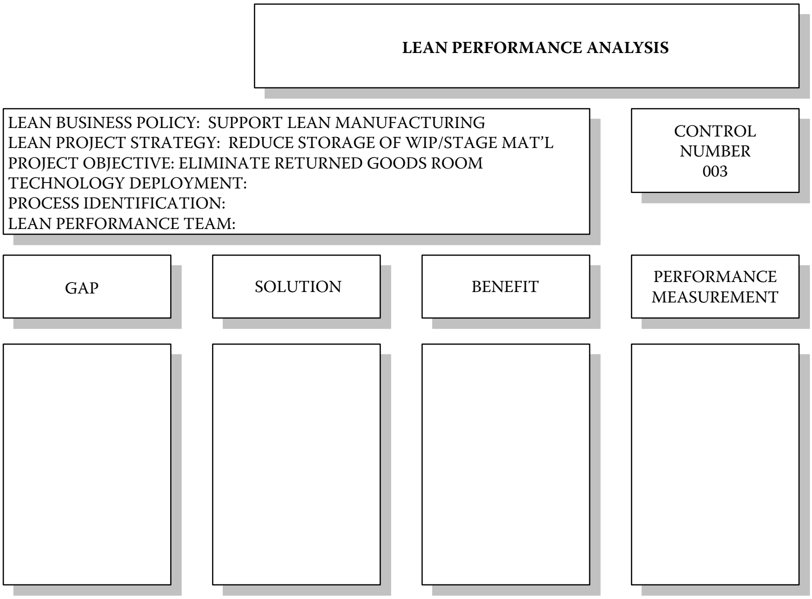


Figure 7.7 Lean Performance Analysis—Project Objective Deployed

- Figure 7.4: Lean Performance Analysis—Lean Project Strategy Deployed
- Figure 7.5: Project Mission Statement
- Figure 7.6: Project Scope Statement
- Figure 7.7: Lean Performance Analysis—Project Objective Deployed

Arrange for the steering committee to communicate Lean Business Policies, Lean Project Strategies, and the project objectives to Lean Performance team members at an initial team meeting. Prepare a summary of the deployed Lean Business Policies, Lean Project Strategies, and project objectives for review by the steering committee, as in Figure 7.8. Then present the summarized policy deployment to the Lean Performance team members at their initial meeting. If possible, have the Lean Performance project sponsor deliver the summary. The emerging project team will return the deployed Lean Business Policies, Lean Project Strategies, and project objectives to the steering committee twice during the project:

- After completion of technology deployment, process identification, and team assignments
- After identification of the proposed process performance measurements

Tentative or preliminary Lean Performance team rosters should be established from the currently identified process areas and invited to the initial meeting.

Probable attendees for the first meeting include the process owners, operators, and customers in the cross-functional areas of the company:

- Finance
- Engineering
- Materials
- Operations
- Information

The steering committee should also use this occasion to deliver its general expectations about the Lean Performance project to the teams. Typically, management expects a process improvement project to identify and eliminate redundant activities. The Lean Performance methodology and projects utilizing that methodology reach quite a bit higher. In addition to identifying and eliminating redundant activities, management can reasonably expect a Lean Performance project to identify and eliminate "disconnected" business processes; implement uniform, documented lean business processes; and produce Process Standards, including process workflows and work instructions, that support training and QS/ISO documentation requirements. The project should implement a consistent information basis for manufacturing and financial business decisions. It should implement process-based performance measurements. Following the Lean Performance methodology, the project process should evolve into Lean Performance Management: a management process that continuously deploys management policy to teams who implement that policy and measure performance results at a process level.

The Lean Performance project organization has legitimate expectations of the steering committee as well. The team expects the steering committee to ensure that the project *is* properly focused (i.e., that the steering committee understands what the job is, uses the right methodology for that job, understands the implications of using that methodology, and supports the project team in managing the consequences of those implications). The Lean Performance organization expects the steering committee to ensure that the project *stays* properly focused, meaning that the steering committee ensures that the project sticks to the job assigned and there is no "scope creep." The teams can also reasonably expect the steering committee to ensure that the methodology is followed and that it supports the project team in measuring and managing the improved processes that result from the project.

POLICY DEPLOYMENT AND MEASUREMENTS SUMMARY							
GAP CONT-ROL#	LEAN BUSINESS POLICY	LEAN PROJECT STRATEGY	DEPLOYED PROJECT OBJECTIVE	TECHNOLOGY DEPLOYMENT	PROCESS IDENTIFIC-ATION	LEAN PERFORM-ANCE TEAM	PERFORMANCE MEASUREMENT
001	Support Lean Manufacturing	Reduce Manufacturing Lead Time	Implement 24 hour turnaround of customer orders				
002	Support Lean Manufacturing	Reduce Manufacturing Inventory	Implement “Pull” Supplier Management Practices				
003	Support Lean Manufacturing	Reduce Manufacturing Inventory	Eliminate Returned Goods Storeroom.				
004	Support Lean Manufacturing	Implement Flexibility For Low Volume Products	Implement Manufacturing Line Sequencing				
005	Support Lean Manufacturing	Implement Flexibility For Low Volume Products	Implement Multi-Plant Sourcing of Finished Goods.				
006	Support Lean Manufacturing	Implement Flexibility For Low Volume Products	Implement EDI/ XML or other E-Commerce Solution for Interplant Orders				
007	Support Lean Manufacturing	Implement Supplier Partnerships and Certification	Implement a Payon-Receipt Process for Vendors				
008	Support Lean Manufacturing	Implement Activity Based Costing	Establish Product Target Costing/ MUDA Free Product Target Costs.				

Figure 7.8 Policy Deployment and Measurements Summary—Project Objective Deployed

POLICY DEPLOYMENT AND MEASUREMENTS SUMMARY							
GAP CONT-ROL#	LEAN BUSINESS POLICY	LEAN PROJECT STRATEGY	DEPLOYED PROJECT OBJECTIVE	TECHNOLOGY DEPLOYMENT	PROCESS IDENTIFICA-TION	LEAN PERFORMA-NCE TEAM	PERFORMANCE MEASUREMENT
009	Support Lean Manufacturing	Implement Process Integrated Document Tools	Implement Bar Coding for Plant Documents				
010	Support Lean Manufacturing	Implement Process Integrated Bar Coding	Implement Bar Coding for Customer Requirements:				
011	Support Lean Thinking in the Global Standardization of Engineering Processes	Design and Utilize Concurrent Engineering Processes	Provide to Engineering Product Data at the Manufacturing Sites.				
012	Support Lean Thinking in the Global Standardization of Engineering Processes	Provide A Standard Software Format For Engineering Product Data Management	Implement a Standard Software Package for Engineering Product Data Management				
013	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Central Cash Management	Determine and Accommodate Financial Requirements of Canada, Europe (EU, VAT), Asia.				
014	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Central Cash Management	Include Currency Considerations				
015	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Processing of Period Financial Closings	Consolidate Regional Financial Statements				
016	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Processing of Period Financial Closings	Consolidate Global Financial Statements				

Figure 7.8 (Continued)

POLICY DEPLOYMENT AND MEASUREMENTS SUMMARY							
GAP CONT-ROL#	LEAN BUSINESS POLICY	LEAN PROJECT STRATEGY	DEPLOYED PROJECT OBJECTIVE	TECHNOLOGY DEPLOYMENT	PROCESS IDENTIFICA-TION	LEAN PERFORMA-NCE TEAM	PERFORMANCE MEASUREMENT
017	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Develop Global Standard Reporting Formats.				
018	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Monitor, Evaluate and Report Product Line and Manufacturing Site Profitability				
019	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Develop Period-To-Date Reporting, Including Regional Sales, Margins and Trends				
020	Support Lean Thinking in the Global Standardization of Information Systems management	Implement Global Standard Hardware and Software	Implement Unmodified Software Packages				
021	Support Lean Thinking in the Global Standardization of Information Systems Management	Implement Global Standard Hardware and Software	Leverage Vendor Supplied Software Upgrades				
022	Support Lean Thinking in the Global Standardization of Information Systems Management	Implement Global Information Technology Processes and Organization	Implement Secure Data & Operations Processes in a System that is Seamless to the Users.				
023	Support Lean Thinking in the Global Standardization of Information Systems Management	Implement Global Information Technology Processes and Organization	Implement Standards for Systems Uptime & Reliability & Measure & Report Performance				
024							

Figure 7.8 (Continued)

Chapter 8

Evaluating and Selecting Software Module

Evaluating and selecting software to support the Lean Performance ERP project is frequently conducted immediately after the formation of the project steering committee. Although ERP software is the primary focus of the Lean ERP project, other software is often included in the evaluation/selection process, such as MES (manufacturing execution system), SCM (supply-chain management), CRM (customer relationship management), and others necessary to the operations of the enterprise. The Lean Performance ERP methodology can be utilized to complete these evaluations, selections, and implementations.

Lean Performance process stream mapping is a "lean business process innovation" tool applied in the lean improvement of business processes. A process stream mapping approach is utilized in the Lean Performance methodology to identify Key Lean Software Features needed to support the organizational and activity processes already in place in the enterprise, as well as "future state" requirements incorporated in the process stream mapping exercises by process owners and operators. The presumption here is that, although the processes may get leaner during the Lean Performance project, many of the Key Lean Software Features needed to support current processes will likely still be required to support the lean processes that result from the project. The inclusion of future state features will provide the opportunity for project team members to utilize these new features where it is determined the features are appropriate. The development of process workflow standards by the Lean Performance teams will confirm whether or not each current or future state software feature is of QCD benefit to the enterprise, process by process, as the project progresses toward implementation. Only a portion of the Lean

Performance process stream mapping methodology is utilized in the evaluation and selection of the Key Lean Software Features necessary to support a Lean Performance ERP implementation. The complete Lean Performance process stream mapping tool incorporates several features not included in this text. The purpose of the process stream mapping exercise here is to highlight and record Key Lean Software Features, not to provide a full blueprint for implementation. It is too early to devote significant time and effort to implementation activities. We are also not going to produce "current state" or "future state" maps of the process stream in the enterprise. Again, we have enough to do in developing a list of the Key Lean Software Features needed in the enterprise. Finally, although the information technology groups and departments are represented in the Key Lean Software Features definition, the entire effort of the IT team in determining technical architecture and analyzing cost of hardware/software scenarios is not explored here.

Many Western industrial mapping methodologies have been developed to document the flow of material into, through, and out of a process. Certainly the Western consulting industry has been instrumental in developing process reengineering, process design, and process redesign methodologies dedicated to that documentation activity. Eastern lean industrial engineering methodologies have also included mapping the flow of information into, through, and out of the process, and also into, through, and out of the stream of processes that compose the product flow from supplier to customer. Information flow has long been seen by Japanese lean thinkers as an integral component of the flow of products, and Western lean thinkers also recognize that deficiencies in the timing, accuracy, and adequacy of information support to the physical process floor as well as to the stream of processes that compose the dock-to-dock supply-chain flow are causes of waste.

A process stream map expands on the practice of process workflow standards mapping by providing a "linked view" of the flow of processes as they accomplish and support the flow of material through the supply chain, including external supply processes, internal physical processes, and external processes all flowing downstream to the customer. On a process stream map, a portion of the map space is utilized to illustrate material flow and a corresponding portion of map space is utilized to illustrate information flow. While completing a process stream map, process owners and operators consider how each process receives notice of requirements. How do process owners know what to work on and how many are necessary? If process operators are not linked to the information flow as well as to the material flow, ask why. Often, overproduction or underproduction is driven by lack of timely accurate information. Expediting is frequently the result of poor information support. Finally, each process that builds to an inaccurate or inadequate schedule pushes inventory to the next process when completed, ready or not, or into WIP storage.

In the Evaluating and Selecting Software Module of the Lean Performance methodology, it is presumed that a thorough evaluation and selection process of standard vendor-supplied packages of ERP software can develop an unmodified implementation of that same software. Unmodified implementations of vendor-supplied software are strategically preferable to modified implementations for several reasons:

- Unless your enterprise manufactures software for sale, it is highly unlikely the skills and expertise exist in your enterprise to effectively manage the process of developing additional software needed to support a Lean Performance ERP project. Far too many implementation projects fail due to lack of performance in the development of software modifications and enhancements.
- The industry expertise needed to design state-of-the-art lean features depends on a high level of expertise in lean industry practices as well as IT architecture, expertise that often does not exist in that combination in your enterprise.
- An implementation that fully enables 90 percent or more of the enterprise process requirements utilizing vendor-supplied packaged software is of far more benefit to the enterprise than can be realized, in most cases, from custom development incompletely applied. Generally speaking, the software vendor employs far more resources and expertise dedicated to the development of software enhancements than does your enterprise.
- Implementing unmodified software enables your enterprise to more readily apply newer versions and enhancements to the vendor software, as your business develops and changes. As technical architecture progresses, your enterprise will be in position to move applications and data to future technical enablers.

For all of these reasons, selecting a "future-oriented" software vendor is more important than ever, as reliance on the vision of the vendor is paramount. Finally, it must be noted that some enterprises are pushing the envelope, developing software enablers for lean practices that they themselves are innovating. Tread these waters carefully. Not all enterprises are lean leaders, nor should they attempt to be. In the Lean Performance methodology, no modifications to vendor-supplied software are specified or proposed unless and until the process owners and operators develop process workflow standards demonstrating what needs to be done in their value-added process. This is reviewed after removing the MUDA in the existing process utilizing the Lean Performance Analysis below and demonstrating that there is a GAP in the software purchased that will need to be solved. The lean enterprise pushing the envelope of lean software development would greatly benefit from the process workflow–Lean Performance Analysis methodology included here.

The Lean Performance methodology assumes that lean principles, tools, and practices must first be present in the management system of the enterprise. Attempting to extend enterprise lean into the Virtual Lean Enterprise is a difficult task. Build from a solid foundation. Software that enables and supports lean practices is being incorporated into some vendor-marketed ERP packages, but lean software development is generally considered to be lagging behind the needs of lean enterprise implementers. In a pattern observed throughout the history of packaged software, smaller vendors of niche or narrow lean software products are emerging. Some of them will eventually be acquired by the larger enterprise software vendors. Some in the enterprise or niche markets are marketing their products as "lean" or "ERP II" software sets. It is, as usual, buyer beware in the software marketplace.

An informed evaluator must look closely at enterprise requirements in general, and lean practice support in particular, in order to navigate the software acquisition minefield. Our evaluation/selection key features are focused on lean software requirements, not "baseline" checklist or "industry-specific" checklist features. These should not be omitted by your evaluation/selection team. It is advised to obtain features checklists for ERP and other software technologies for reference during this process. Vendor-specific and industry-vendor checklists for the primary vendors you are considering should also be obtained. Most vendors will have some baseline checklist responses. Others are available for nominal amounts on the Internet. There is no need to get bound up in the types of issues such as "we need a 12-character vendor master field"—the vendor features checklists can be noted to this point and vendors can answer these issues during the software sales cycle. For now, it is the focus of the evaluation/selection team to concentrate on the Key Lean Software Features for Lean ERP implementation.

An educated evaluation/selection team will be fully informed on the requirements in its respective process areas, including lean requirements. In this process, teams will determine what their particular Key Lean Software Features are, with decisions taken on critical elements of software support for enterprise lean practices, including need for modules that support design of flow lines, production smoothing logic, capability to synchronize Operational TAKT to Customer TAKT, incorporation of kanban replenishment calculations, and the ability to quickly address engineering changes online. Be aware that some vendors and consultants have developed algorithms, terms, and alleged lean practices that may or may not be viable in your lean enterprise. Remember, the leanest answer is always the simplest answer to the complex problem.

Management Tasks

Organize the Software Evaluation and Selection Project Team

In the Lean Performance Assessment, many of the future members of the evaluation/selection team were identified, including representatives from key process areas of the enterprise. The first task for the steering committee is to designate the process area team leaders who are responsible to deliver the Key Lean Software Features. The process areas utilized as examples in this book will provide the framework for illustrating the Key Lean Software Features:

- Business Planning
- Production and Operations
- Customer Relationship
- Product Engineering
- Financial Management
- Inventory and Logistics
- Supply Chain
- Performance Measurement

We will also deliver a Key Lean Software Features listing for the General Requirements needed of the selected software. These are noted in each workshop and augmented by the IT professionals. Other process areas that may warrant a workshop and Key Lean Software Features process could include warehousing, distribution (DRP), human resources (for ergonomics, benefits/pay systems), or other process areas as your enterprise requires.

Project Team Tasks

Organize the Project Office and Conference/Education Room

The project manager should have set up the project office by this time, and a conference/education room should be permanently dedicated to the Lean Performance project. If a dedicated space cannot be found, then strict scheduling must be performed by the project manager to ensure that appropriate space is available for the workshops.

Determine Key Lean Software Features Workshop Attendees

Process area team leaders should identify organizational-level process owners in their process areas to include on the team. Refer to the organizational process diagram above for a reference tool to assist in identifying organizational processes. Remember, your organizational processes may be different, so use the diagram as a tool and not as an all-inclusive list for your enterprise. Rosters of process-area teams will be adjusted upward and downward as the overall Lean Performance project progresses. Also, organizational process owners may include process operators in some sessions in order to ensure that a thorough definition of Key Features is developed. Other important potential members have been designated in the Lean Performance Assessment. Although the IT process area leader may desire to attend multiple workshops, or send business system analysts to multiple workshops, a wise process area leader does not allow "outsiders" to the process area to make presentations of predetermined "future states" or other predeveloped technology-driven solutions. This is a workshop for asking questions and determining “raw” Key Lean Software Feature requirements, not a software sales session. It shouldn’t need mentioning, but these sessions are strictly “no vendors allowed.”

Review All Lean Strategy/Policy/Project Objectives LPA Masters

All process area team leaders should be familiar with the policy deployment LPA masters for the project. Copies of the LPA masters should be available for review and notation in the conference/education room.

Conduct Process Area Workshops

The first activity for process-area team leaders is to conduct several workshops in their respective process areas. The MUDA and 5 Ss workshops are especially important in an enterprise that has either no lean practice experience or the experience is limited to the physical processes. In the case of a process area team leader who does not have the expertise to lead a workshop, then the project manager should arrange for another process area team leader or outside resource to conduct the workshops. Workshops include The 9 Forms of Office MUDA, The Office 5 Ss, and The 5 Ss for the Computer Room.

The 9 Forms of Office MUDA Workshop is a workshop that is usually scheduled for one day in each process area. Additional days can be scheduled for multidepartment or large-enterprise process areas. These workshops familiarize the office team members with a lean thinking perspective and provide orientation to the later process stream mapping sessions. Although the standard 3 MUs (MUDA) Checklist included above can also be used, opposition to the 3 MUs among office workers can often be defeated by using a checklist more specific to office information/support processes. When conducting the workshops, it may be helpful to begin by establishing some meeting ground rules. Here are the Lean Performance suggested rules, also incorporated below.

- Meetings start on time.
- Meetings finish on time.
- Decisions are by consensus.
- Keep an open mind to change.
- There is no such thing as a dumb question.
- Maintain a positive attitude.

- Never leave a silent disagreement.
- Create a blameless environment.
- Practice mutual respect every day.
- Treat others as you want to be treated.
- One person, one vote. No position or rank.
- No magic wand. This is about education and working smarter.
- Participate, etc.

Here is a MUDA checklist that can be utilized with the workshop attendees:

The 9 Forms of Office MUDA Checklist

Waiting—because of the customer, for mail or courier, for signatures, for prints/plots, in lines, because of unavailable resources, etc.

____
____
____

Overproduction—multiple copies of forms, drawings, printing documents in advance of when needed, duplication of or reentering data.

____
____
____

Quality defects—incorrect data entered, drawing errors, errors in service transaction.

____
____
____

Transportation—filing of documents/work in progress.

____
____
____

Motion—location of printer/photocopier or catalogs or filing cabinets, unnecessary movement, need for multiple stops for filing or distribution.

____
____
____

Inventory—paper or forms not available, substitutions needed for forms or templates, multiple templates or forms used for same task in process, excess or outdated catalogs and books or magazines.

____
____
____

Process—overprocessing (signatures), duplication, or process overprocessing: need for signatures, duplication or reentry of data, recopying of data.

____
____
____

Unclear communication—need to ask more than once, hold multiple conversations or meetings because of logistics or schedules or other availability.

____
____
____

Opportunity lost—to win new customers, losing existing customers, ignoring customers.

____
____
____

Other:

____
____
____

The 5 Ss in the Office Checklist

To begin the Office 5 Ss, workers in a process area must think about their requirements. What materials, stationery, equipment (phones, computers, fax machines), or consumables (printer ink, copier toner, batteries, cleaning supplies, conference supplies) are needed daily, weekly, and monthly? What paper and form support is needed?

Although the 5 Ss Checklist included above can also be used, opposition to the 5 Ss among office workers can often be defeated by using a checklist more specific to office information/support processes.

Here is a 5 Ss checklist that can be utilized with workshop attendees:

The Office 5 Ss Checklist

Are binders holding common information labeled and organized and visible to those who need to use them (include policy manuals, workflow documentation, system software manuals, hardware users' manuals, and fax machine instructions, etc.)?

____
____
____

Are office supplies "inventoried" visually?

____
____
____

Are office supplies stored and organized so that replenishment of central stocks can be easily performed?

____
____
____

Are office supplies "delivered" via shopping cart to all users, so inventory and storage locations can be controlled, while distribution is more efficient?

____
____
____

Is there a replenishment system for consumable items to ensure a constant supply without accumulation or "stock-outs"?

____
____
____

Are personal desk folders and files organized to reduce search time and inconvenience?

____
____
____

Are electronic folders and files organized to reduce search time and inconvenience?

____

____

____

Are there clear policies with reasonable limits governing personal belongings in office and workstation areas? What percentage of work space is reasonable for personal belongings?

____

____

____

Has there been clear communication of 5 Ss standards, including publication of policies or training?

____

____

____

Has the 5 Ss training been updated and provided to new personnel?

____

____

____

Are office personal belongings neat and tidy?

____

____

____

Are markers and erasers in conference rooms readily accessible and working properly?

____

____

____

Are visual guidelines in place governing clean-up of common spaces?

____

____

____

Are there simple visual postings of conference room configurations (layout standards) to make it easy for conference room users to reestablish conference room configurations when meetings are completed?

____
____
____

Are there simple posted visual work instructions for things like the fax machine and common printers?

____
____
____

Are there monthly audits conducted to ensure conformance to posted and written 5 Ss policies, standards, configurations, and work instructions?

____
____
____

Process area team leaders should develop standards for the placement of supplies in their respective areas and illustrate the standards on a standards sheet posted in their process area. When the process area is 5 S'd, photos should be posted with the standards sheet for ease of auditing. Define the 5 Ss requirements and regular audits on the standards, with frequency, responsibility, and maintenance and safety checks included. At the conclusion of the 5 Ss workshop, each area will have defined its regular activities and checks. At that time, an enterprisewide standard audit should be established and conducted in every area every month, with the results collated and displayed.

Here is a 5 Ss checklist that can be utilized with the information department attendees.

5 Ss in the Computer Room Checklist

Equipment—How many old servers, terminals, PCs, keyboards, boards, disc drives, CPUs, and other equipment are stored in or near the IT department?

____
____
____

Equipment—How many old servers, terminals, PCs, keyboards, boards, disc drives, CPUs, and other equipment are stored anywhere not covered in (1) above?

____
____
____

Electronic documents—How much waste is involved in trying to find valuable information in the ever-growing mountain of electronic documents stored and supported in your document storage applications?

____
____
____

Knowledge management—How coherent and well organized are the document hierarchies, ownership, change control, and indexes contained in your knowledge management applications? Anything not coherent and well organized?

____
____
____

What are the results of your customer satisfaction surveys on questions 4 and 5?

____
____
____

How are the binders, folders, and other vendor documentation (hardware, software, peripherals, etc.) labeled and organized?

____
____
____

Conduct Key Lean Software Features Workshops

Conduct a process stream mapping workshop for each process area. Typically, this is a four- to five-day off-site exercise. Schedule process stream mapping workshops for the following process areas, or as your enterprise requires:

- Business Planning
- Production and Operations
- Customer Relationship

- Product Engineering
- Financial Management
- Inventory and Logistics
- Supply Chain
- Performance Measurement

Process Stream Key Lean Features Checklist

1. Begin by having each process area team leader collect all the paperwork (with examples) for use in the stickie generation activity. Follow each organizational process. Always follow the same order, quote, and product release for the exercises.
2. Identify Key Lean Software Features on the stickies or other moveable support tool. Collect them for inclusion on the Key Lean Software Features checklist.
3. Identify process issues for immediate solution after the workshop. Do not slow down to solve them—the process-area team leaders and teams can do that later. We are here to identify Key Lean Software Features.
4. Beginning with a blank whiteboard, follow *one* unit of work—an item, lot, order, or batch through the entire process as it is performed today.
5. Discuss the steps or tasks in the process in order to identify process features requirements.
6. Discuss disruptions in the flow. Identify what *really* happens, not what is *supposed* to happen.
7. Discuss each Key Lean Software Feature that is critical to the process. Here are several discussion points that may reveal the need for a feature:
    a. Examine the usage of information, including manual reports.
    b. Investigate the absence of crucial data or process support.
    c. Determine bottlenecks in information flow.
8. Ask if the feature will be needed in the lean enterprise—keep it if in doubt.
9. Solicit "future state" Key Lean Software Feature suggestions from the team:
    a. Are there any desired enhancements to current process support, including information turnaround improvements?
    b. What about desired new applications?
    c. Are there any identifiable benefits, including reduced processing costs, that can be driven by new features?
10. Review the suggested Key Lean Software Features examples:
    Figure 8.1: Key Lean Software Features—General Requirements
    Figure 8.2: Key Lean Software Features—Business Planning
    Figure 8.3: Key Lean Software Features—Production and Operations
    Figure 8.4: Key Lean Software Features—Customer Relationship
    Figure 8.5: Key Lean Software Features—Product Engineering

KEY LEAN SOFTWARE FEATURES
GENERAL REQUIREMENTS

- Does the software incorporate:
  - Current data integrity tools?
  - Rapid system implementation tools?
  - Flexible system configuration tools?
  - Built in Process Workflow configuration tools?
  - Tools to facilitate integration with other systems?
  - Rapid and simple information visibility?
  - Lean, Six Sigma, TOC, or other business strategies?
  - Capability to run on multiple technology platforms, including open platforms?

a

KEY LEAN SOFTWARE FEATURES
GENERAL REQUIREMENTS

- Does the software incorporate (cont.):
  - E-Business and web-business features?
  - Project management tools for production projects
  - Project management tools for capital projects?
  - Project management tools for product introduction and release projects?
  - Application and support needed in our specific vertical industry segment?
  - Guided template and table set-up support?
  - Simple flexible report and inquiry retrieval tools?

b

KEY LEAN SOFTWARE FEATURES
GENERAL REQUIREMENTS

- Does the software incorporate (cont.):
  - On-Line Help?
  - A central data construct with no disconnects?
  - A non-batch real time process architecture?
  - Tools to ensure efficient high volume transaction processing?
  - Strong document management features?
  - Strong quality assurance support?
  - Superlative education, training and support?
  - A strong, competitive future product plan?

Figure 8.1c Key Lean Software Features—General Requirements

KEY LEAN SOFTWARE FEATURES
BUSINESS PLANNING

- Does the software incorporate
  - Support for generation of a master production schedule to drive MRP calculations utilizing actual demand, sales forecasts, larger of or a combination of actual and forecast data?
  - Multiple time fences (at least 3 planning periods)?
  - Capability to employ a variety of combinations of other time fence and demand source rules?
  - Support forecasting and demand planning for subcomponents, subassemblies, raw materials and other 2-level Master Scheduling practices?

a

KEY LEAN SOFTWARE FEATURES
BUSINESS PLANNING

- Does the software incorporate (cont.):
  - Ability to stimulate demand with discounts and advertising?
  - Group requirements–same, similar?
  - Tools to optimize constraints-time, material, labor, equipment, manpower?
  - A control panel or dashboard for the Sales and Operations Planners?
  - Support for Sales and Operations Planning?

Figure 8.2b Key Lean Software Features—Business Planning

Figure 8.6: Key Lean Software Features—Financial Management
Figure 8.7: Key Lean Software Features—Inventory and Logistics
Figure 8.8: Key Lean Software Features—Supply Chain
Figure 8.9: Key Lean Software Features—Performance Measurement

Prepare a Draft of the Key Lean Software Features Checklist

Convert the stickies and notes into a listing of Key Lean Software Features for your process area. List the conclusion as in the examples provided above.

Report Progress to Management Steering Committee

The project manager is also responsible to provide interim reporting to the steering committee on progress and results. Report the Key Lean Software Features required to the steering committee for consideration in budgeting and acquiring new software enablers.

KEY LEAN SOFTWARE FEATURES
PRODUCTION AND OPERATIONS

- Does the software incorporate tools to:
  - Pull signal/kanban support to replenish material at Customer Service Levels maintaining level WIP?
  - Convert multi-level bills-of-material into standard process/flat BOMs?
  - Eliminate traditional MRP-based indented bills-of-material to routings?
  - Translate indented BOMs to flat bills lacking subassemblies or parent assembly?
  - Perform constraint management?

a

KEY LEAN SOFTWARE FEATURES
PRODUCTION AND OPERATIONS

- Does the software incorporate (cont.):
  - Kanban cards with logic to ensure production completion?
  - Kanban logic that re-calculates size and number of kanban bins continuously?
  - Kanban logic that flags and makes changes to existing kanbans whether they are physical kanbans or electronic kanbans in the system?
  - Tools for managing flow production including daily production planning tools that consider line capacity and available material?

b

KEY LEAN SOFTWARE FEATURES
PRODUCTION AND OPERATIONS

- Does the software incorporate tools to (cont.):
  - Manage flow production including workbench capability for determination of schedule compliance and production line and time slotting?
  - Perform line balance considering multiple lines?
  - Illustrate graphical analysis of daily production?
  - Accomplish interface & full integration with process control systems?
  - Track non-production material movement and storage?

c

KEY LEAN SOFTWARE FEATURES
PRODUCTION AND OPERATIONS

- Does the software incorporate tools to (cont.):
  - Manage documentation and work instructions?
  - Record work “as performed” by configuration and processes utilized?
  - Record actual process costs, highlighting differences from process standards?

Figure 8.3d Key Lean Software Features—Production and Operations

KEY LEAN SOFTWARE FEATURES
CUSTOMER RELATIONSHIP

- Does the software incorporate tools to:
  – Support management of product configuration, including ability to determine customer order variations of load patterns?
  – Support product configuration key parts requirements allocations and real-time available to promise?
  – Ensure that document is correct?
  – Support product configuration demand loading and line sequencing?
  – Ensure proper configuration was completed against booked order?

a

KEY LEAN SOFTWARE FEATURES
CUSTOMER RELATIONSHIP

- Does the software incorporate tools to (cont.):
  – Support certification tracking and inspections?
  – Track defects and process variation analysis?
  – Ensure that tooling, materials and processes are correct?
  – Prepare accurate estimates of work expense?
  – Develop pricing with categories for profitability?
  – Manage contractual commitments?
  – Develop Quality Plans and Monitoring utilizing six sigma practices?

Figure 8.4b Key Lean Software Features—Customer Relationship

KEY LEAN SOFTWARE FEATURES
PRODUCT ENGINEERING

- Does the software incorporate :
  – Electronic work method sheets and online work instructions?
  – Lists of parts and tools required for a process routing?
  – Quality criteria for each process standard routing?
  – Tools to manage engineering change orders?
  – Workflow technology to quickly send engineering changes to production?

a

KEY LEAN SOFTWARE FEATURES
PRODUCT ENGINEERING

- Does the software incorporate (cont.) :
  – Tools to perform integrated product and process design management?
  – Tools to manage group technology?
  – Tools to model the manufacturing or service process?
  – Tools to manage alternate configurations and process definitions?
  – Tools to manage releases and change management?

Figure 8.5b Key Lean Software Features—Product Engineering

KEY LEAN SOFTWARE FEATURES
FINANCIAL MANAGEMENT

- Does the software incorporate tools to:
  - – Develop and track comprehensive budgets?
  - – Facilitate operations and finance?
  - – Manage funding and billing?
  - – Manage collections and disbursements?
  - – Support bookkeeping for enterprise, business unit and cost center?
  - – Track costs by program, project, and process standard?
  - – Cost and compare budget versus actual?

a

KEY LEAN SOFTWARE FEATURES
FINANCIAL MANAGEMENT

- Does the software incorporate tools to (cont.):
  - – Monitor process and product process cost variances
  - – Manage asset management?
  - – Inventory and assess human resource skill matrix?
  - – Develop a “transactions matrix” to assist in lean transformation
  - – Manage and administer benefits and payroll?
  - – Manage lean gain-sharing programs?

b

KEY LEAN SOFTWARE FEATURES
FINANCIAL MANAGEMENT

- Does the software incorporate tools to (cont.):
  - – Support development of “Box Score” financial reporting?
  - – Support target costing?

Figure 8.6c Key Lean Software Features—Financial Management

KEY LEAN SOFTWARE FEATURES
INVENTORY AND LOGISTICS

- Does the software incorporate tools to:
  - – Manage backflush capabilities governed by process standard BOMs?
  - – Manage consumption of excess, alternates and substitutes?
  - – Manage general supplier management?
  - – Support vendor managed inventory?
  - – Manage point of use consumption?
  - – Optimize route support and milk runs for drivers?

Figure 8.7a Key Lean Software Features—Inventory Management and Logistics

KEY LEAN SOFTWARE FEATURES
INVENTORY AND LOGISTICS

- Does the software incorporate tools to (cont.):
  – Support electronic interchange for tendered loads, in-transit RFID status and delivery confirmation?
  – Optimize order pickers' travel?
  – Manage consignment inventory?
  – Manage point of use inventory?
  – Track kanban totes, including RFID?
  – Simulate production shipping schedules with routes and rates?

Figure 8.7b (Continued)

KEY LEAN SOFTWARE FEATURES
SUPPLY CHAIN

- Does the software incorporate tools to:
  – Support reduction in supplier defects?
  – Manage and administer purchase orders, including blanket and release purchase administration and model year administration?
  – Support supplier partnerships and supplier certification?
  – Utilize collaborative kanban directly from point of use?

a

KEY LEAN SOFTWARE FEATURES
SUPPLY CHAIN

- Does the software incorporate tools to (cont.):
  – Continuously recalculate kanban sizing relative to Customer and Operations TAKT?
  – Optimize space in transit, distribution warehousing and shop floor?
  – Signal suppliers when parts levels drop below safety quantities?

Figure 8.8b Key Lean Software Features—Supply Chain

KEY LEAN SOFTWARE FEATURES
PERFORMANCE MEASUREMENT

- Does the software incorporate
  – Daily and periodic backflush reporting?
  – Kanban shortage reporting?
  – Material use variances?
  – Resource utilization?
  – Daily planned production?
  – Actual versus planned supplier delivery frequency?
  – Simplified process standard costing?

Figure 8.9 Key Lean Software Features—Performance Measurement

Chapter 9

Managing Project Module

Project Team Tasks

Maintaining the Project Summary Bar Chart

A preliminary Project Summary Bar Chart should be prepared in advance of the initial team meeting to illustrate overall project timing. The example in Figure 9.1 shows the project divided into modules that correspond with the methodology being presented.

Maintaining Project Communications

To maintain effective project communications, a project Web page should be established, including a project e-newsletter and discussion chat room. Various project management spreadsheets will be posted by the project manager and maintained by the project team through Web access.

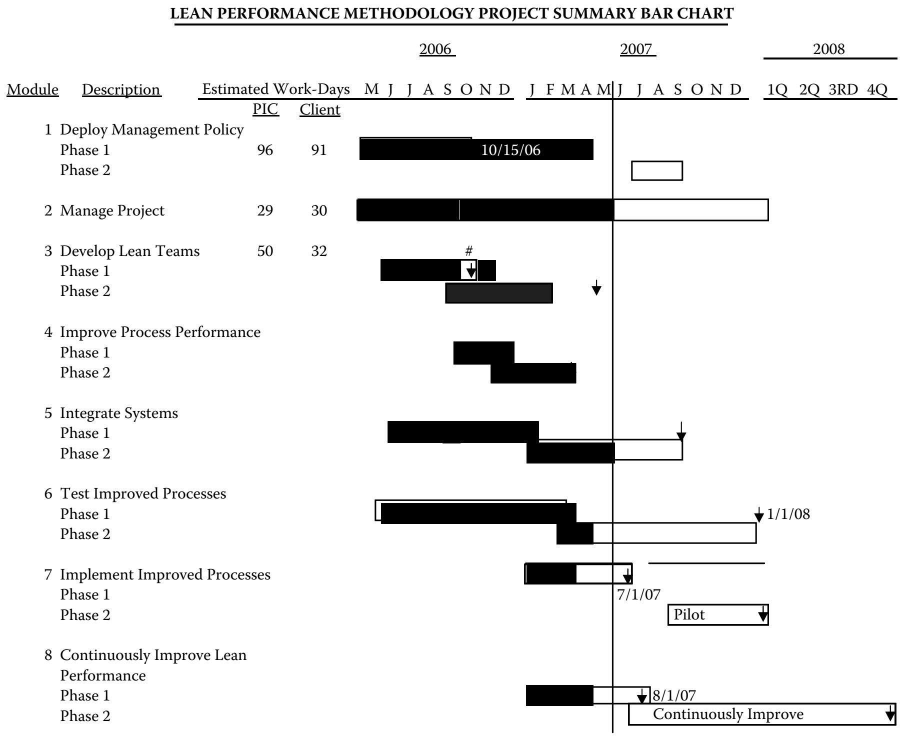


Figure 9.1 Lean Performance Methodology Project Summary Bar Chart

Maintaining the Project Plan

A Project Work Plan should be developed to monitor progress. The work plan must include the process implementation sequence as well as the key tasks in each process implementation. Figure 9.2 demonstrates one approach.

Using the Project Work Plan, the project manager should monitor all tasks of the implementation process, including overall planning and review as well as coordination and review among Lean Performance teams in completion of assigned tasks for improved process implementation. One of the primary responsibilities of the Lean Performance project manager is to review Project Work Plan status and assignments as necessary, update the project work plan as appropriate, and use the Project Summary Bar Chart to provide project status reports to the steering committee.

Maintaining an Open Issues Resolution Process

The project manager should establish an Open Issues Resolution Process as soon as the project begins, not after issues begin to stack up. Establish and maintain an Internet- or intranet-based open issues control log (in spreadsheet form, if possible)

LEAN PERFORMANCE PROJECT MANAGE PROJECT MODULE WORK PLAN

MODULE - TASK	STEP	DESCRIPTION	RESPONSIBILITY	ESTIMATED WORK-DAYS PIC	CLIENT	TARGET START DATE	TARGET COMPLETE DATE

1. Prepare a preliminary Project Summary Bar Chart to Illustrate Project Timing.

   • Deliverable: Project Summary Bar Chart

2. Maintain Project Communications

   1. Establish WEB page for project communications

   2. Establish The Project e-newsletter

3. Develop Project Work Plan and Monitor Progress

   1. Define implementation responsibility by product and product line

4. Monitor all tasks of the implementation process. Provide overall planning and review.

   1. Provide coordination and review among Lean Performance Teams in completion of assigned tasks for each process implementation.

Figure 9.2 Project Work Plan

to which all project team members have access. Link it to the project Web page or make it accessible from the Web page, if possible. As each point is resolved, document for review by appropriate users.

In order to communicate the structure and operation of the Open Issue Resolution Process to the team, write a procedure that illustrates that the purpose of the Open Issue Resolution Process is to manage the process of reporting, organizing, and resolving open issues during the project. Clarify that open issues are issues encountered during the project that a team member or system user feels must be resolved before new Process Standards can be implemented. Guarantee that all written issues will be investigated and responded to. The Lean Performance project manager assigns open issue resolution priority.

In some cases resolution of an open issue may be categorized as not critical or not possible to provide for the initial implementation. Assure the originators of issues that cannot be immediately addressed that their issues will be evaluated during the Continuously Improve Lean Performance module for inclusion in the eventual system.

Issues must be written up and submitted to the project manager by the team that encounters the issue for the open issue to be considered for resolution. Figure 9.3 illustrates an example. A procedure for completing the information is included below.

LEAN PERFORMANCE PROJECT
ISSUES REPORTING AND RESOLUTION FORM

ORIGINATOR ________________ISSUE NUMBER_______PRIORITY ____

ORIGINATING PLANT _______________ ISSUE TYPE: (CHECK BELOW)

ORIGINATION DATE ________________ SYSTEM OPERATIONS ____

SYSTEM AREA _____________________ SYSTEM SECURITY ____

REFERENCE: SYSTEM BUG ____

PROGRAM # _______________________ MODIFICATION NEEDED ____

SCREEN # ________________________ BUSINESS/POLICY ____

REPORT # ________________________ MOD NOT WORKING ____

RESOLUTION ASSIGNED TO: HEADCOUNT REQUIRED ____

_________________________________ PROCEDURE UPDATE ____

DATE REQUIRED ___________________ TRAINING REQUIRED ____

DESCRIPTION: ____

____

____

____

ALTERNATE RESOLUTIONS: ____________________________________

____

____

____

ACCEPTED RESOLUTION:

____

____

RESOLUTION ACCEPTED BY: ________________DATE CLOSED: ______

DATE SUBMITTED TO SITE LEADER _____________________________

DATE SUBMITTED TO PROJECT MANAGER___________________________

Figure 9.3 Open Issue Form

The project manager will respond and manage the issue as outlined in the procedure. Issues can be written in any of the following categories:

- System operations
- System security

- System bug
- Modification needed
- Business decision/policy needed
- Modification not working
- Workaround requires additional headcount
- Process workflow/work instruction updating
- Training required

If team members think they have an issue and don't see how it fits into a category, they should write it up and submit it anyway. The Open Issue Resolution Process to be followed is illustrated by the following steps. The steps refer to Figure 9.4, an open issue template with labeled entry blocks or fields. This type of open issue template can also be created and posted on the Web page for use by team members.

Step 1: The originator completes blocks 1, 4, 5, 6(a–i),7, 8, 9, 10, 13, and 14: The originator is the person who first encounters the issue. The originator is responsible for defining the issue and documenting the issue on an issue form. An originator can rely on another team member or user to write the issue; however, the originator must submit the issue and answer any questions that may be asked to clarify the issue and define solutions.

Step 2: The originator must submit the issue to the project site leader ASAP. The originator will also provide copies of Process Standards (workflows and work instructions), screens, and reports where applicable. Project site leaders verify completion of necessary information and check the issue log spreadsheet for similar or redundant issues. Project site leaders complete block 18. Project site leaders submit issues to the project manager ASAP via Web posting, fax, or personal delivery.

Step 3: The project manager completes blocks 2, 3, 11, 12, and 19. The project manager reviews alternative resolutions with users and, where necessary, any resources such as consultants, the software helpline, etc. The project manager completes the following:

- Assigns an issue number
- Determines priority/initials
- Assigns responsibility for resolution
- Accepts date required or determines schedule for resolution
- Indicates all information on form
- Accepts issue for resolution
- Enters the issue on the open issue log/spreadsheet

Step 4: If the issue is a system bug, the project manager will report it to the software vendor and return the issue with the software vendor "fix" number assigned. The project manager will verify receipt of the bug fix to the originator and coordinate testing of fix prior to closing the issue.

```
                 LEAN PERFORMANCE PROJECT
           ISSUES REPORTING AND RESOLUTION FORM

ORIGINATOR ________1_______ISSUE NUMBER___2___PRIORITY __3_

ORIGINATING PLANT _________4_____  ISSUE TYPE: (CHECK BELOW)

ORIGINATION DATE __________5_____  SYSTEM OPERATIONS    _6a_

SYSTEM AREA _______________7_____  SYSTEM SECURITY      _6b_

REFERENCE:                         SYSTEM BUG           _6c_

PROGRAM # _________________8_____  MODIFICATION NEEDED  _6d_

SCREEN #  _________________9_____  BUSINESS/POLICY      _6e_

REPORT #  _________________10____  MOD NOT WORKING      _6f_

RESOLUTION ASSIGNED TO:            HEADCOUNT REQUIRED   _6g_

________________________11_____    PROCEDURE UPDATE     _6h_

DATE REQUIRED ____________12_____  TRAINING REQUIRED    _6i_

DESCRIPTION:  ____________13________________________________

____________________________________________________________

____________________________________________________________

____________________________________________________________

ALTERNATE RESOLUTIONS: _____14_____________________________

____________________________________________________________

____________________________________________________________

____________________________________________________________

ACCEPTED RESOLUTION:
______________________________15____________________________

____________________________________________________________

RESOLUTION ACCEPTED BY________16________DATE CLOSED____17___

DATE SUBMITTED TO SITE LEADER___________18______________

DATE SUBMITTED TO PROJECT MANAGER_______________19__________
```

Figure 9.4 Open Issue Template

Step 5: If the issue is a modification that is not working, or is an issue that has been approved by the steering committee for modification, the process for managing modifications begins. The modification number will be the same as the issue log number.

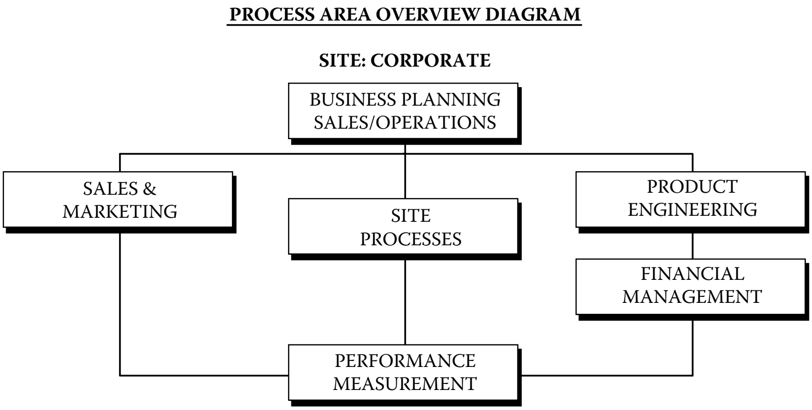


Figure 9.5 Business Process Areas Overview—Diagram for Corporate Site of a Manufacturer

Step 6: The person assigned to provide resolution will resolve the issue and present findings to the originator and project manager. When resolution is accepted, the issue form will be completed and the open issue log updated. The person assigned to provide resolution completes block 15. The originator completes block 16 to verify acceptance of resolution, or returns.

Step 7: The project manager reviews and closes the issue: The project manager also completes block 17 and updates the issue log spreadsheet.

Maintaining the Project Organization

The key to building a successful project team is to identify all process owners in the organization and include them on the organization chart (and in the project). To begin, you must identify all of the processes (and you won't get it right the first time).

Identify and organize the preliminary project organization necessary for the project by identifying process areas on a preliminary basis. Processes are generally found in process areas as illustrated in Figure 9.5 at the corporate site of a manufacturing company.

A manufacturing site engaged in assembling products for the aftermarket will probably more closely resemble the process area architecture illustrated in Figure 9.6.

Finally, an international (as well as many domestic) manufacturing site will probably closely resemble the process-area architecture illustrated in Figure 9.7.

Considering the process area structure of each site in the organization, a preliminary Project Organization Chart of the Lean Performance team is defined.

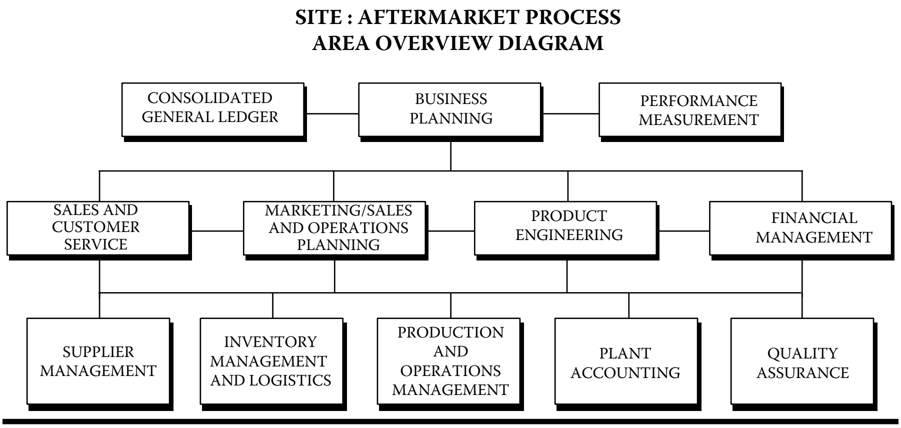


Figure 9.6 Business Process Areas Overview—Diagram for Manufacturer of Products for the Aftermarket

After determining the process area owners and a site leader for each site, prepare the initial Project Organization chart, including:

- Steering Committee
- Project Manager
- Site Leaders
- Process Area Owners

Figure 9.8 illustrates a project organization that includes this structure.

Maintaining the project organization chart is the ongoing responsibility of the project manager. At various points in the project, the chart will need to be updated to reflect additions to the team, especially when all processes are identified and all process owners and customers are included on the overall project team.

Maintaining the Quality Assurance Process

Maintaining the quality assurance process is also an ongoing responsibility as the project manager administers the project and ensures the overall quality of effort. Maintaining the quality assurance process includes monitoring project status, identifying roadblocks affecting progress, and developing project progress reporting for steering committee meetings. As we have already seen, the project manager also assists with problem identification and resolution through the Open Issues Process.

To this point, the involvement of the project champion/sponsor has been enough to carry the effort forward and ensure the quality of the project planning result. Now that there is a formal project, with a project manager and project team, an additional resource is needed. A quality assurance review should include

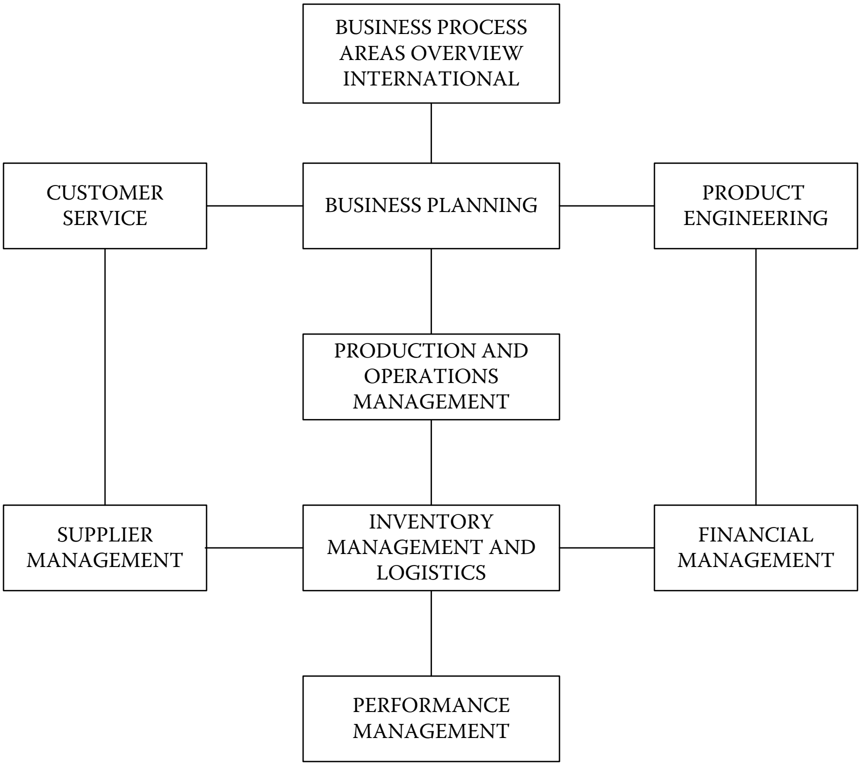


Figure 9.7 Business Process Areas Overview—Diagram for an International Manufacturer

a perspective from outside of the project. At each quality assurance review, the project manager and outside reviewer should examine the project work plan and corresponding results. The reviewers should make sure the project is proceeding on task, on schedule, and on budget within the project mission and scope. Quality assurance reviews should be conducted at project checkpoints prior to steering committee meetings and at the completion of important project milestones at the end of each module of process tasks. In the Lean Performance methodology, quality assurance reviews and steering committee meetings are held at the following project points:

- Lean Performance Planning
  - 1st: Manage Project
  - 2nd: Develop Lean Performance Teams
- Lean Performance Improvement
  - 1st: Improve Process Performance
  - 2nd: Integrate Systems

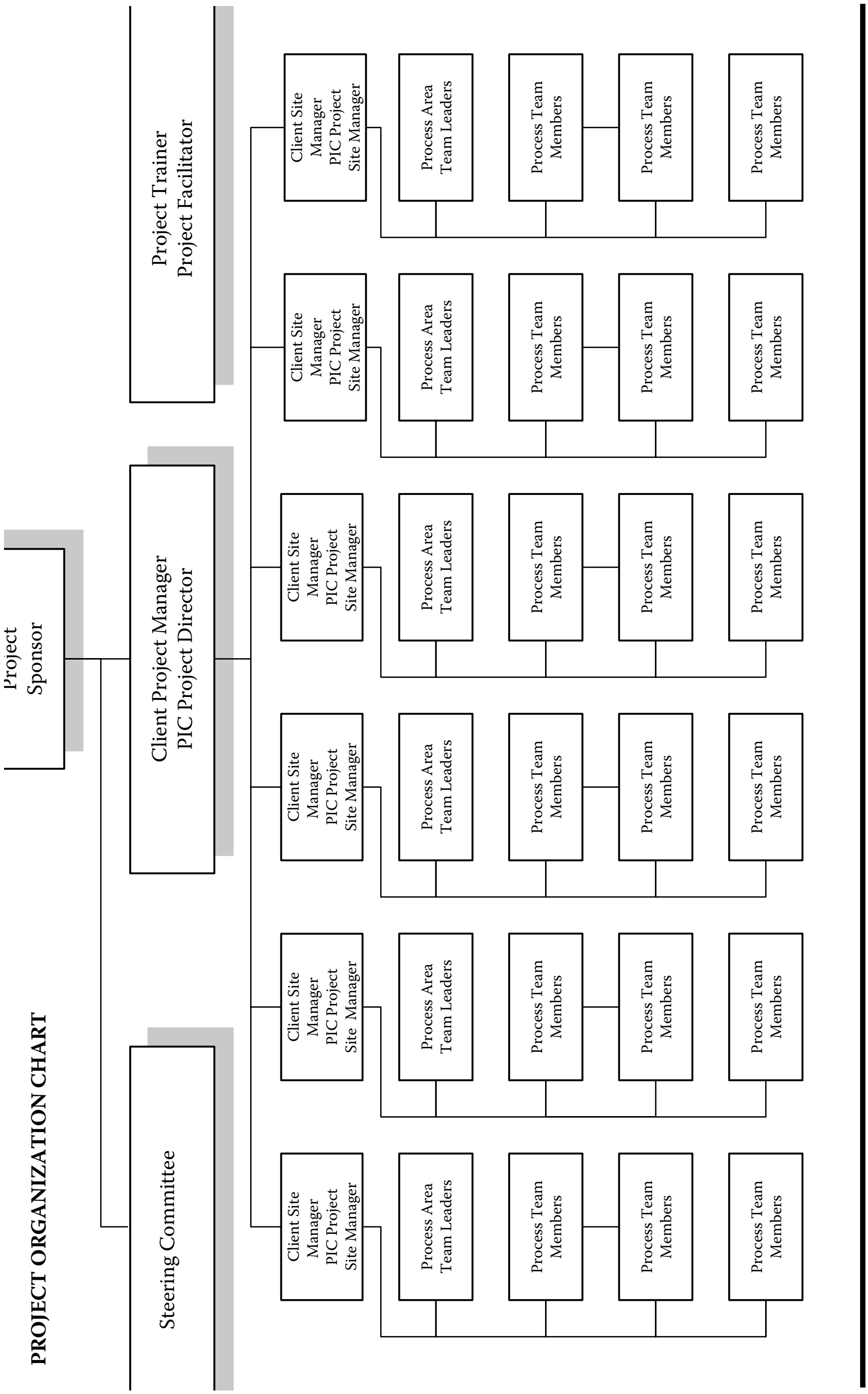


Figure 9.8 Project Organization Chart

  - 3rd: Test Improved Processes
- Continuously Improve Lean Performance
  - 1st: Implement Improved Processes
  - 2nd: Continuously Improve Lean Performance

The project management tools should be utilized to support the quality assurance process and prepare for the steering committee meetings. Include the following at the project management quality assurance review:

- Figure 7.1: Lean Business Policies
- Figure 7.2: Lean Performance Analysis—Lean Business Policy Deployed
- Figure 7.3: Lean Project Strategies
- Figure 7.4: Lean Performance Analysis—Lean Project Strategy Deployed
- Figure 7.5: Project Mission Statement
- Figure 7.6: Project Scope Statement
- Figure 7.7: Lean Performance Analysis—Project Objective Deployed
- Figure 7.8: Policy Deployment and Measurements Summary—Project Objectives Deployed
- Figure 9.1: Project Summary Bar Chart
- Figure 9.2: Project Work Plan
- Figure 9.3: Open Issue Form
- Figure 9.4: Open Issue Template
- Figures 9.5, 9.6, 9.7: Business Process Areas Overview (diagrams as necessary)
- Figure 9.8: Project Organization Chart

Reporting Progress to the Steering Committee

Report progress to the steering committee as part of the initial project team meeting, utilizing the project management diagram tools completed and reviewed at the project management quality assurance review. During the project, the familiarity of the steering committee with the visual tools will greatly assist the project decision analysis.

Chapter 10

Developing Lean Performance Teams Module

Project Team Tasks

Finalizing Projects and Strategies

To assess the current projects that might adversely affect or overlap with the Lean Performance project, the project manager should develop a Current Projects and Strategies Definition. Start by organizing information discussed at the initial project team meeting, by the project steering committee and project team for each site. Identify all current application or manufacturing technologies projects under way or in management review. Define current projects approved or under way in manufacturing support systems. Identify other business or manufacturing strategies likely to affect the timing of the project. Confirm their inclusion or applicability to the lean business policies, lean project strategies, and project objectives already deployed. Verify that major lean business policies and strategies likely to affect the timing of lean process implementation are contained in the identified project objectives, including manufacturing system implementation or modification, especially any "interim or phased" development. Meet with site leaders to finalize the Current Projects And Strategy Definition. Figure 10.1 is an example of a current projects and strategies definition.

**CURRENT PROJECTS
AND STRATEGIES DEFINITION**

SITE: CORPORATE

1 PURCHASING AND TRAVEL CARD UTILIZATION WILL CHANGE PROCESSES IN ACCOUNTS PAYABLE

2 PAYROLLS, (SALARY, UNION) WILL CONTINUE TO BE DONE OUTSIDE OF PRIMARY SOFTWARE. LABOR INTERFACES MAY BE REQUIRED

3 HR SYSTEMS ARE CONNECTED TO THE PAYROLL SYSTEM AND WILL BE CONTINUED OUTSIDE OF PRIMARY SYSTEM

4 ENGINEERING PDM DATABASE WILL NOT BE ADDRESSED INITIALLY WITHIN PROJECT, HOWEVER, NEEDS REVIEW PRIOR TO ENGINEERING DOING INDEPENDENT DEVELOPMENT

5 PROJECT WILL PROCEED WITHOUT "KEY" PLAYERS IN FINANCE, SALES, AND MARKETING, BUT PROGRESS WILL BE LIMITED IN THESE AREAS

6 COMMUNICATION LINKS FOR NORTH AMERICA WILL BE COMPLETED PRIOR TO OCTOBER 2001

7 ENGINEERING PLANNING WILL NOT INCLUDE AUTOMATED INFORMATION FLOW FROM CAD IN THE INITIAL PHASE

8 PITNEY BOWES INSTALLATION AND INTERFACE WILL BE COMPLETED IN PROJECT

Figure 10.1 Current Projects and Strategies Definition

This definition is a vehicle to utilize for reporting to the steering committee at the next meeting. Prior to being incorporated into the project workplan, projects are selected *or* deselected by the steering committee. The final project comprises all final project plans. All project elements accepted as the responsibility of the project team should be carefully incorporated into the project plan.

Developing the Site Configuration

Site Configuration diagrams are developed to document and visually communicate system configuration decisions as budgeted. Equipment and communication lines are illustrated as they will be implemented. Networks and intranets are illustrated. Software vendor-sizing profiles are updated, and decisions are made.

To determine a site configuration, conduct a preliminary technical analysis of hardware requirements necessary to support implementation. Verify or complete the vendor-sizing profiles. Identify manufacturing considerations, including the development of project priorities, resource and budget requirements, and adequacy of software for unmodified implementation. Determine the degree of systems integration, and identify system interfaces required to support site needs.

Evaluate existing projects and plans. Identify alternatives and priorities, where possible. Determine information systems resource requirements for the project. Also, estimate how many long-term information systems personnel are needed. Outline alternative short-term improvement strategies where possible. Confirm hardware delivery for each site to support process workflow activities. Evaluate and determine if the systems configuration architecture is adequate.

To complete or review the software vendor-sizing profiles, analyze the following issues:

- Item/part masters
- Bills of material
- Routings
- Throughput
- Storage requirements
- Communication requirements
- Printer, terminal, and PC requirements

Perform an initial load analysis on all project hardware. Update the hardware strategy as necessary, then review budgets with information systems management and verify completion of site preparation requirements. Complete and publish a site configuration diagram for the project. Figure 10.2 provides an example.

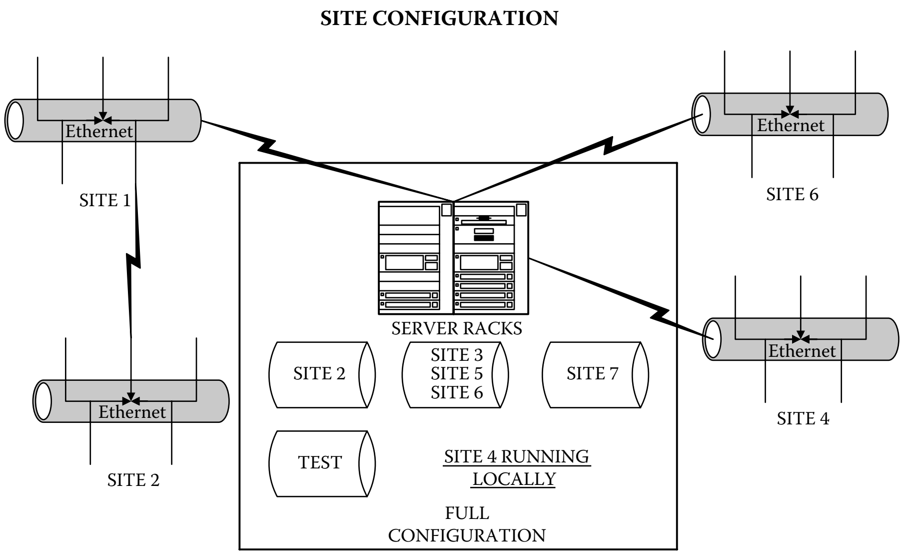


Figure 10.2 Site Configuration

Identifying All Processes

Processes are the operating structures by which an organization does what is necessary to produce value for its customers. A process is an activity that involves people, that is designed to produce an output, that contains a specific ordering of work activities across time and place, and that is a structure for doing work.

Processes utilize enablers to perform tasks that produce the business outputs of the organization. In our estimation, an ERP, MES, APS, CRM, or SCM system is a process enabler every bit as much as a CNC drill is a process enabler.

Lean processes are processes where lean principles, tools, and practices are applied to the use of enablers to improve process Lean Performance. All processes are candidates for Lean Performance for two primary reasons:

- Processes are usually designed (*if at all*) at the outset of operations.
- Thereafter, they evolve in response to new demands but not necessarily systematically. They begin to acquire dysfunctional attributes.

With the occasional exception of physical processes, most processes are not reflected in organizational structures. They do not follow existing boundaries of organizational power and authority. They are not defined or described in the same way by those who participate directly in them.

Processes have boundaries, but they generally operate across organizational or enterprise boundaries. A process boundary can be *functional*, covering one department or unit, or *cross-functional*, covering more than one department or unit. A process can also be *cross-enterprise*, covering more than one company or enterprise. Lean Performance means making work *flow* cross-functionally and cross-enterprise wherever possible. An organization that does not identify its suppliers and customers as owners and customers of processes cannot be said to be working cross-enterprise (supply-chain process, new product introduction process).

Process identification and Lean Performance Analysis are integrative steps in a Lean Performance project because, although a business can be thought of as one long continuous process, it can't be improved that way.

Processes are organizational building blocks. Lean improvements cannot be made *between* cross-functional and cross-enterprise processes until they have been made *within* these processes. Lean processes are necessary if there is to be a lean management team, staff, organization, and workforce, and a Virtual Lean Enterprise.

Process identification enables process integration, demonstrating that processes generally are not organized or performed in the appropriate department, are not "flat" (i.e., the customer order process could contain and more readily perform shipping or other customer relationship tasks), and are not completely defined or standardized in most businesses.

Information/Support Process Characteristics		
Inputs	Throughputs	Outputs
Data	Logic, Distribution and Other Applications To Tasks	Information, Reports Instructions, Documents

Figure 10.3 Information/Support Process Characteristics

Process identification also shows duplication or lack of integration between areas, where a process (or part of a process) might be performed more than once. Figure 10.3 provides examples of identifiable process characteristics.

Processes have owners. Process owners are responsible for the design and execution of their processes, and for ensuring that customer needs are met by processes. Owners have primary responsibility to maintain and utilize the processes to produce their output.

Information/support process owners have primary responsibility to maintain and utilize their process, not to maintain the *data* or transaction (machine) process that enables the information/support process.

Processes have an identifiable recipient or customer: those who use the process output, whether internal or external. Customers are generally found downstream from the process owner. An information/support process is an activity designed to produce and consume information at its interim and final outputs, and an information/support process customer uses the process output, or the information. In Lean Performance, process customers must agree and sign off that the process delivers the output that they require.

All processes in all process areas should be identified at each site by site leaders through interviewing and exploration with managers, key users, and process owners, operators, and customers.

Process areas (not necessarily departments) were illustrated previously by the project manager and site leaders. The Business Process Area Diagrams that resulted were presented to the steering committee. These diagrams are a good place to start the discussion needed to identify all process areas at each site according to Lean Performance team members (which is everyone you've identified so far).

The areas in which processes are found by the emerging project site teams may and probably will be different than originally documented on the Business Process Area Diagrams. Identifying process areas and processes is a little like peeling an onion. The full set of process areas should be verified by the emerging Lean Performance team at each project site.

To verify process areas, the project site teams should also collect summary documentation of present systems and ensure that all process areas have been verified for each location.

An overview of the areas in which processes are found should then be completed by the site-level Lean Performance team. These areas are then illustrated in dia-

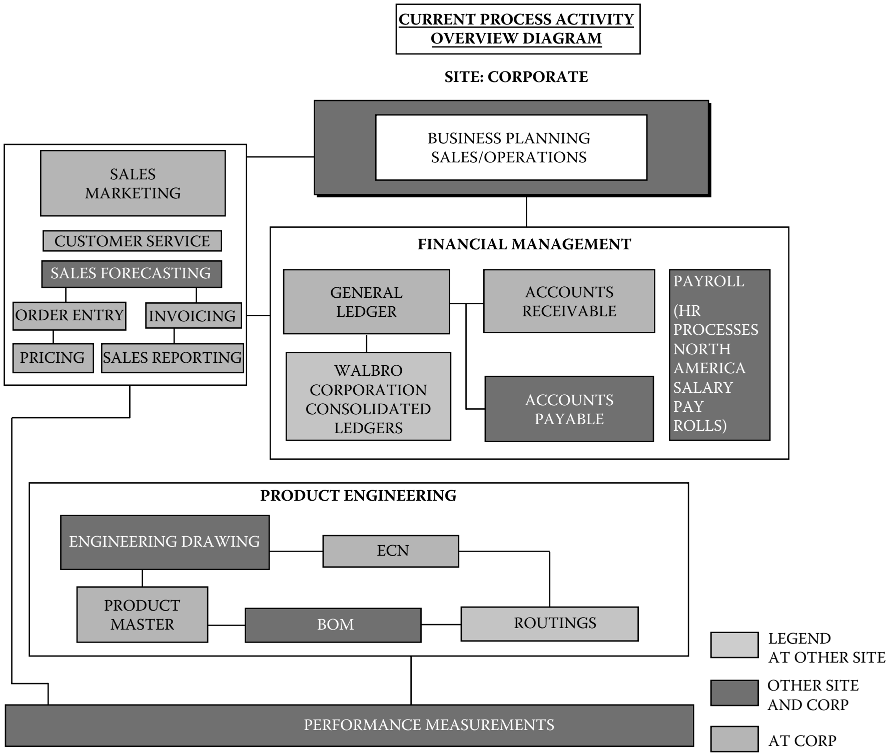


Figure 10.4 Current Process Activity Overview Diagram (Corporate)

grams. Examples are found in Figures 10.4, 10.5, and 10.6 for the sites illustrated in our Business Process Area Overview Diagrams (Figures 9.5, 9.6, and 9.7).

Note how team members at these sites have illustrated several of the organizational processes found in many of the process areas. This is the beginning of the process definition and improvement activities, initiated by team members using a project visual to illustrate their own perspective on process view. Project site leaders and teams then identify all the processes in each of the process areas in which they are performed at their site. Within each of the process areas there will generally be a number of activity processes. The work is usually being performed in the activity processes.

Identifying the activity processes is usually easy. You just have to ask somebody (and asking anybody but the process operators is a big mistake). In process identification, the focus is not on what people do, but rather on what happens to the data, material, or work. Begin at the raw material or data inputs (beginning boundary) and end at the finished product or information output (ending boundary). Tasks being performed must be discrete enough to improve. These tasks are generally producing outputs for internal customers.

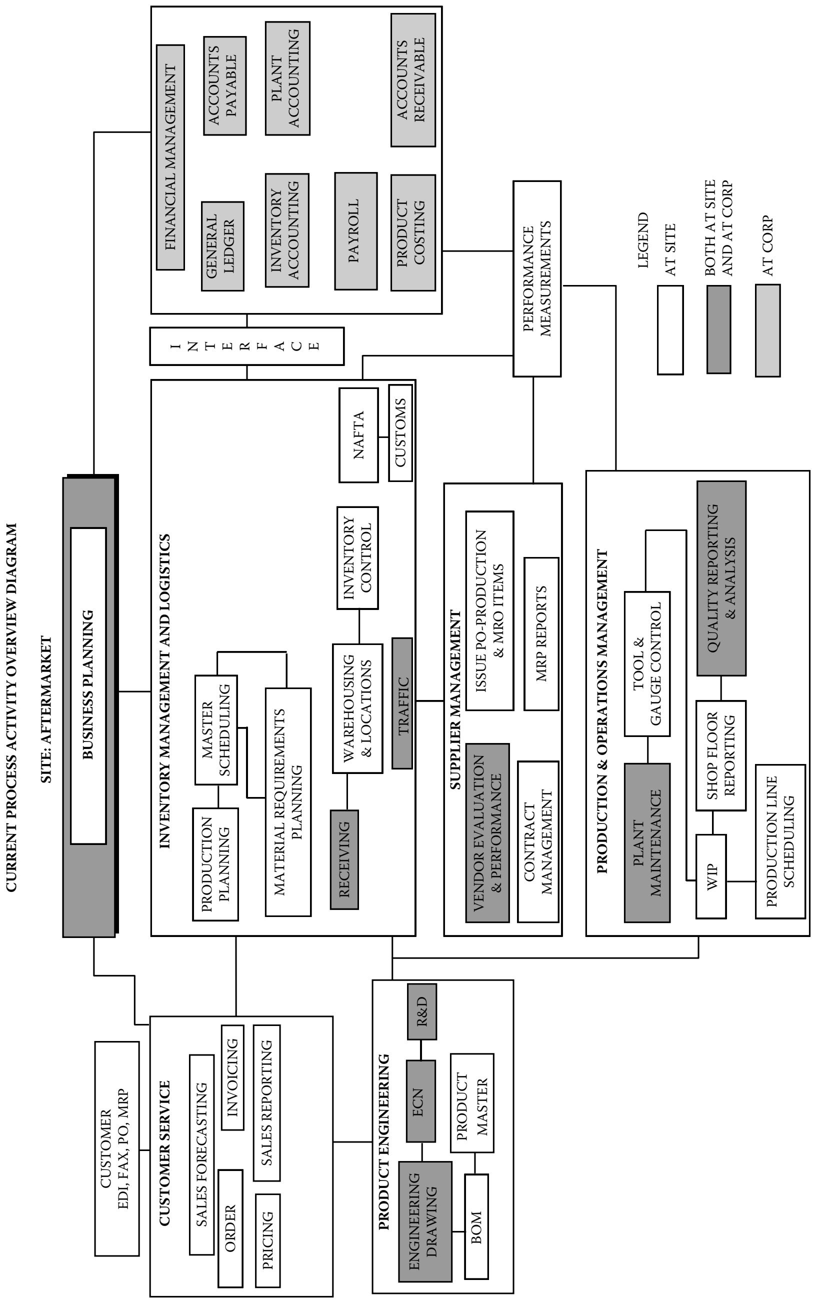


Figure 10.5 Current Process Activity Overview Diagram (Aftermarket)

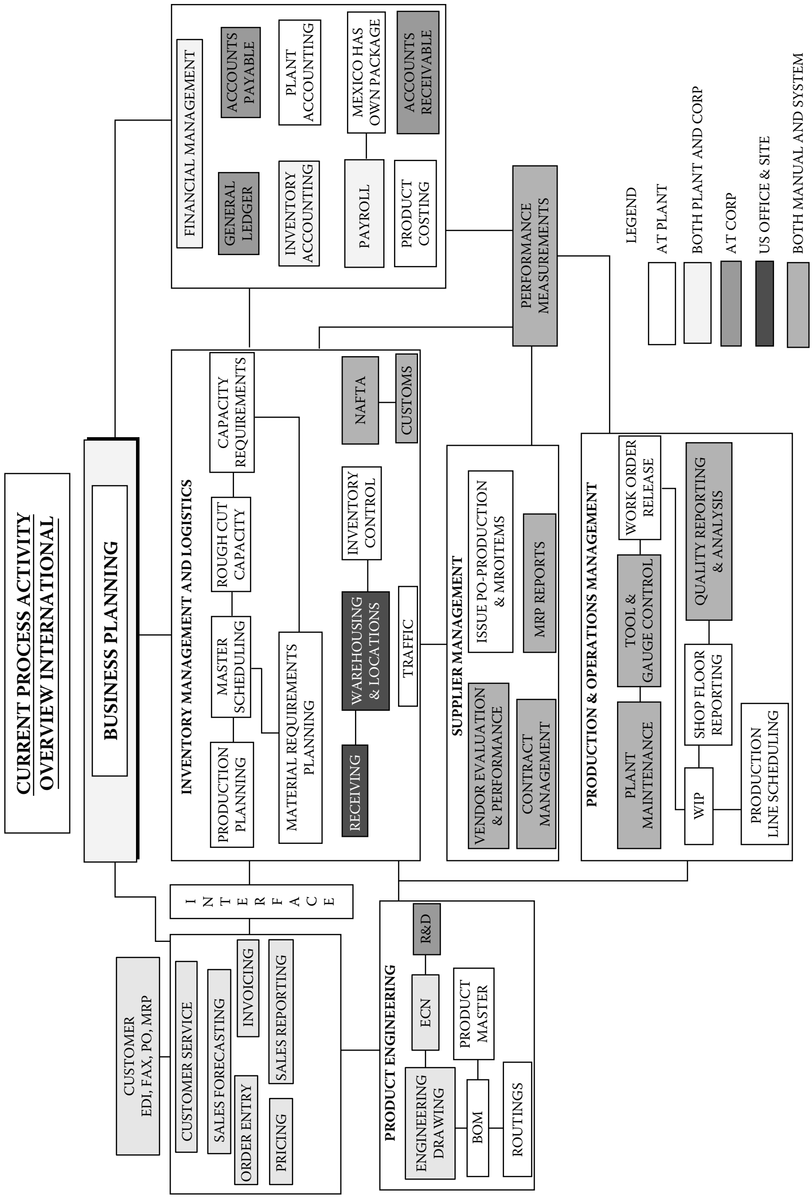


Figure 10.6 Current Process Activity Overview Diagram (International)

LEAN PERFORMANCE PROJECT PROCESS LISTING & SEQUENCE ALL SITES

PRIMARY PROCESS	ACTIVITY AREA	SUPPORTING PROCESS	SUBORDINATE PROCESS	MASTER INDEX #	TRANSL-ATION	WORK FLOW	SYSTEM MAP	SCHEDULE COMPLETION
CUSTOMER SERVICE	Service	Quality Reporting	Customer Returns	CS-01	Complete	Open	Open	
CUSTOMER SERVICE	Invoicing	Invoicing		CS-02.01	Open	Open	Open	
CUSTOMER SERVICE	Invoicing	Cum. Shipped Recon.		CS-02.02	Open	Open	Open	
CUSTOMER SERVICE	Pricing	Pricing		CS-03	Open	Open	Open	
CUSTOMER SERVICE	Sales Forecasting	Sales Forecasting		CS-04.01	Open	Open	Open	
CUSTOMER SERVICE	Sales Forecasting	Quoting		CS-04.02	Open	Open	Open	
CUSTOMER SERVICE	Order Entry	Order Processing		CS-05.01	Open	Open	Open	
CUSTOMER SERVICE	Order Entry	Purchase Order Maint.		CS-05.02	Open	Open	Open	
CUSTOMER SERVICE	Order Entry	Aftermarket Order Proc.		CS-05.03	Open	Open	Open	
INV. MGMT. & LOGISTICS	Master Scheduling	Master Scheduling	Demand Determination	IL-01.01	Open	Open	Open	
INV. MGMT. & LOGISTICS	Master Scheduling	Master Scheduling	Production Mix/Qty.	IL-01.02	Open	Open	Open	
INV. MGMT. & LOGISTICS	Receiving	Az. Warehouse		IL-02.01	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Receiving	Incoming at plant		IL-02.02	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Receiving	Stockroom		IL-02.03	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Receiving	Incoming Inspection		IL-02.04	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Receiving	MRO Supplies		IL-02.05	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Receiving	Sample Parts		IL-02.06	Open	Open	Open	
INV. MGMT. & LOGISTICS	Traffic	FG Exportation		IL-03.01	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Traffic	Exportation of HAZMAT		IL-03.02	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Traffic	FG Warehousing		IL-03.03	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Traffic	Az. Warehouse		IL-03.04	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Traffic	Returnable Containers		IL-03.05	Open	Open	Open	
INV. MGMT. & LOGISTICS	Traffic	Bar Code Labeling		IL-03.06	Open	Open	Open	
INV. MGMT. & LOGISTICS	Inv. Control	Cycle Count		IL-04.01	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Inventory Control	Production Report		IL-04.02	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Inventory Control	Lot Control		IL-04.03	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Inventory Control	Parts Recovery		IL-04.04	Open	Open	Open	
INV. MGMT. & LOGISTICS	Inventory Control	Piece Count Verification		IL-04.05	Open	Open	Open	
INV. MGMT. & LOGISTICS	Inventory Control	Bulk Issues		IL-04.06	Open	Open	Open	
INV. MGMT. & LOGISTICS	Inventory Control	Physical Inventory		IL-04.07	Open	Open	Open	
INV. MGMT. & LOGISTICS	Work Order Release	Designation		IL-05.01	Complete	Open	Open	
INV. MGMT. & LOGISTICS	Warehousing	Warehouse Configuration		IL-06	Open	Open	Open	
SUPPLIER MANAGEMENT	MRP Reports	MRP Planning	Review	SM-01	Complete	Open	Open	Open
SUPPLIER MANAGEMENT	Contract Mgmt.	Purchase Order Process	Requisitions	SM-02.01	Complete	Complete	Complete	Open
SUPPLIER MANAGEMENT	Contract Mgmt.	Purchase Order Process	PO Generation	SM-02.02	Complete	Complete	Complete	Open

Figure 10.7a Lean Performance Project Process Listing and Sequence

LEAN PERFORMANCE PROJECT PROCESS LISTING & SEQUENCE ALL SITES

PRIMARY PROCESS	ACTIVITY AREA	SUPPORTING PROCESS	SUBORDINATE PROCESS	MASTER INDEX #	TRANSL-ATION	WORK FLOW	SYSTEM MAP	SCHEDULE COMPLETION
SUPPLIER MANAGEMENT	Contract Mgmt.	Purchase Order Process	Spot Buys	SM-02.03	Complete	Complete	Open	Open
SUPPLIER MANAGEMENT	Contract Mgmt.	Purchase Order Process	Expedite (Dom.)	SM-02.04	Complete	Complete	Open	Open
SUPPLIER MANAGEMENT	Contract Mgmt.	Purchase Order Process	Expedite (For.)	SM-02.05	Complete	Open	Open	Open
SUPPLIER MANAGEMENT	Contract Mgmt.	Purchase Order Process	Reschedules	SM-02.06	Complete	Open	Open	Open
SUPPLIER MANAGEMENT	Contract Mgmt.	Purchase Order Process	Tooling Orders	SM-02.07	Complete	Open	Open	Open
SUPPLIER MANAGEMENT	Contract Mgmt.	Purchase Order Process	Mailing PO	SM-02.08	Complete	Open	Open	Open
SUPPLIER MANAGEMENT	Contract Mgmt.	Purchase Order Process	MRO PO	SM-02.09	Complete	Open	Open	Open
SUPPLIER MANAGEMENT	Supplier Evaluations	Sourcing/Quotations	Selection	SM-03.01	Complete	Complete	Open	Open
SUPPLIER MANAGEMENT	Supplier Evaluations	Sourcing/Quotations	AVL	SM-03.02	Complete	Open	Open	Open
SUPPLIER MANAGEMENT	Supplier Evaluations	Sourcing/Quotations	Supplier Set-Up	SM-03.03	Complete	Complete	Open	Open
SUPPLIER MANAGEMENT	Supplier Evaluations	Sourcing/Quotations	RFQ	SM-03.04	Complete	Complete	Complete	Open
SUPPLIER MANAGEMENT	Supplier Evaluations	Reporting	Performance Rating	SM-03.05	Complete	Open	Open	Open
PROD. & OPERATIONS	Prod. Line Scheduling			PO-01	Complete	Open	Open	
PROD. & OPERATIONS	Prod. Line Scheduling	Pilot Runs		PO-01.01	Open	Open	Open	Open
PROD. & OPERATIONS	WIP	Machining/Castings		PO-02.01	Complete	Open	Open	Open
PROD. & OPERATIONS	WIP	Machining/Covers		PO-02.02	Complete	Open	Open	
PROD. & OPERATIONS	WIP	Material flow		PO-02.02.01	Complete	Complete	Complete	
PROD. & OPERATIONS	WIP	Pre-Assembly		PO-03.01	Open	Open	Open	
PROD. & OPERATIONS	WIP	Final 1 Assembly		PO-03.02	Open	Open	Open	
PROD. & OPERATIONS	WIP	Final 2 Assembly		PO-03.03	Complete	Open	Open	
PROD. & OPERATIONS	WIP	Material flow for Pre-Assy., Final1, Final2		PO-03.03.01	Complete	Complete	Complete	
PROD. & OPERATIONS	WIP	WED production		PO-04.01	Complete	Open	Open	
PROD. & OPERATIONS	WIP	Material Flow for MA series		PO-04.01.01	Complete	Complete	Complete	
PROD. & OPERATIONS	WIP	Material flow for MB series		PO-04.01.02	Complete	Complete	Complete	
PROD. & OPERATIONS	WIP	Diecasting -TPP		PO-05.01	Complete	Open	Open	
PROD. & OPERATIONS	WIP	Diecasting Material Flow		PO-05.01.01	Complete	Open	Open	
PROD. & OPERATIONS	Shop Floor Reporting	Prod. Reporting		PO-06.01	Open	Open	Open	
PROD. & OPERATIONS	Shop Floor Reporting	Labor Reporting		PO-06.02	Open	Open	Open	
PROD. & OPERATIONS	Work Order	Releases		PO-07.01	Complete	Open	Open	
PROD. & OPERATIONS	Work Order Release	Component Requisitioning		PO-07.02	Complete	Open	Open	
PROD. & OPERATIONS	Plant Maintenance	Preventive Maint.		PO-08.01	Open	Open	Open	
PROD. & OPERATIONS	Quality Reporting	Deficiency Reporting		PO-09.01	Complete	Open	Open	
PROD. & OPERATIONS	Quality Reporting	Sort/Rework/Scrap/RTV		PO-09.02	Complete	Open	Open	
PROD. & OPERATIONS	Quality Reporting	Component Sampling		PO-09.03	Open	Open	Open	
PROD. & OPERATIONS	Quality Reporting	Small Parts Inspection		PO-09.04	Complete	Open	Open	
PROD. & OPERATIONS	Quality Reporting	Machine Line Inspection		PO-09.05	Complete	Open	Open	

Figure 10.7b (Continued)

LEAN PERFORMANCE PROJECT PROCESS LISTING & SEQUENCE ALL SITES

PRIMARY PROCESS	ACTIVITY AREA	SUPPORTING PROCESS	SUBORDINATE PROCESS	MASTER INDEX #	TRANSL-ATION	WORK FLOW	SYSTEM MAP	SCHEDULE COMPLETION
PROD. & OPERATIONS	Quality Reporting	Pre-Assy. Inspection		PO-09.06	Complete	Open	Open	
PROD. & OPERATIONS	Quality Reporting	Final 1 Inspection		PO-09.07	Complete	Open	Open	
PROD. & OPERATIONS	Quality Reporting	Final 2 Inspection		PO-09.08	Complete	Open	Open	
PROD. & OPERATIONS	Quality Reporting	Final Teardown		PO-09.09	Complete	Open	Open	
PROD. & OPERATIONS	Quality Reporting	Final Visual		PO-09.10	Complete	Open	Open	
PROD. & OPERATIONS	Quality Reporting	Scrap Accounting		PO-09.11	Complete	Open	Open	
PROD. & OPERATIONS	Tool & Gauge Control			PO-10	Open	Open	Open	
FINANCIAL MANAGEMENT	Customs	Importation of Prod. Material		FM-01.01	Complete	Open	Open	
FINANCIAL MANAGEMENT	Customs	MRO Importation		FM-01.02	Complete	Open	Open	
FINANCIAL MANAGEMENT	Customs	Exportation Invoicing		FM-01.03	Complete	Open	Open	
FINANCIAL MANAGEMENT	NAFTA	Certificates of Origin		FM-02.01	Complete	Open	Open	
FINANCIAL MANAGEMENT	NAFTA	Assembly Description		FM-02.02	Complete	Open	Open	
FINANCIAL MANAGEMENT	Product Costing	Product Costing		FM-03.01	Complete	Open	Open	
FINANCIAL MANAGEMENT	Product Costing	Standard Costs		FM-03.02	Complete	Complete	Complete	
FINANCIAL MANAGEMENT	Product Costing	CRN's		FM-03.03	Complete	Open	Open	
FINANCIAL MANAGEMENT	Product Costing	Quality Cost Reporting		FM-03.04	Open	Open	Open	
FINANCIAL MANAGEMENT	Cash Management	Petty Cash Disbursement		FM-04	Complete	Open	Open	
FINANCIAL MANAGEMENT	Payroll	Distribution		FM-05	Complete	Open	Open	
FINANCIAL MANAGEMENT	Accounts Payable	Accounts Payable		FM-06	Complete	Open	Open	
FINANCIAL MANAGEMENT	General Ledger	Finance Statements		FM-07.01	Complete	Open	Open	
FINANCIAL MANAGEMENT	General Ledger	Walbro Policy		FM-07.02	Complete	Open	Open	
FINANCIAL MANAGEMENT	General Ledger	Government Reporting		FM-07.03	Complete	Open	Open	
FINANCIAL MANAGEMENT	General Ledger	Taxes		FM-07.04	Complete	Open	Open	
FINANCIAL MANAGEMENT	General Ledger	Month End Closing		FM-07.05	Open	Open	Open	
FINANCIAL MANAGEMENT	Inventory Accounting	Valuation		FM-08	Complete	Complete	Complete	
BUSINESS PLANNING	Business Planning	Business Planning		BP-01	Complete	Complete	Open	
BUSINESS PLANNING	Business Planning	Labor Requirements		BP-01.01	Complete	Complete	Open	
BUSINESS PLANNING	Business Planning	Materials Requirements		BP-01.02	Complete	Complete	Complete	
BUSINESS PLANNING	Business Planning	Purchase Plan		BP-01.02.01	Complete	Complete	Open	
PRODUCT ENGINEERING	ECN	ECN Set up		PE-01.01	Complete	Complete	Complete	
PRODUCT ENGINEERING	ECN	Change Notice		PE-01.02	Open	Open	Open	
PRODUCT ENGINEERING	ECN	Change Coordination		PE-01.03	Open	Open	Open	
PRODUCT ENGINEERING	BOM	Parts List Maint.		PE-02	Open	Open	Open	
PRODUCT ENGINEERING	R & D	Development		PE-03.01	Open	Open	Open	
PRODUCT ENGINEERING	R & D	New Product Releases		PE-03.02	Open	Open	Open	
PRODUCT ENGINEERING	Product Masters	Where First Used List		PE-04.01	Open	Open	Open	

Figure 10.7c (Continued)

LEAN PERFORMANCE PROJECT PROCESS LISTING & SEQUENCE ALL SITES

PRIMARY PROCESS	ACTIVITY AREA	SUPPORTING PROCESS	SUBORDINATE PROCESS	MASTER INDEX #	TRANSL-ATION	WORK FLOW	SYSTEM MAP	SCHEDULE COMPLETION
PRODUCT ENGINEERING	Product Masters	Data Maintenance		PE-04.02	Open	Open	Open	
PRODUCT ENGINEERING	Engineering Drawing	Print Distribution		PE-05.01	Open	Open	Open	
PRODUCT ENGINEERING	Engineering Drawing	Drawing Maintenance		PE-05.02	Open	Open	Open	

Figure 10.7d (Continued)

Individual process steps and tasks usually are separated by queues and waiting time that involve the movement of interim outputs from place to place and provide for the involvement of more than one individual in the overall process sequence. Identifying individual tasks and operations as processes or a group of duties performed by one individual or department as a process is usually wrong. Within a group of tasks, if you haven't produced an output, you haven't completed a process. Remember, the focus is not on what people do but rather on what happens to the material or work.

In summary, a *leanable* process:

- Has an identifiable owner/operator.
- Has an identifiable input or set of inputs, such as labor, information, materials, and instructions.
- Consists of sets of tasks, steps, operations, or functions performed in sequence.
- Produces an identifiable output such as a physical product, service, or information.
- Has an identifiable customer for the output.
- Has boundaries (i.e., a definite beginning and a definite ending). The starting point (boundary) of any process is the point of input to the process of the data or material to the first task that *processes* or *changes* that input. The ending point (boundary) of any process is the point of output of the product of that process.

After all processes are identified, a list of processes for each site is submitted to the project manager. These process lists are consolidated, with common organizational and activity processes and site-specific processes identified. This sequences the process standards development so multiple-site teams can work without redundant effort, and it resolves the differences in identification and terminology of the various sites' processes. It also determines sequence of workflow standards assignments and process areas, by location. Refer to Figure 10.7 for an example. One of the compelling reasons for approaching the task of process identification from a process expert perspective is that process owners and operators tend to call their processes by the names that have evolved for them in the organization, often predating the process experts themselves. Discovering this also leads to the realization that the process configuration itself is unique to the organization. This sequence is essential to the eventual alignment of the processes to the enabling software. The comfort level of the process experts is established when you start the process of implementation and lean improvement where *they are*, not where software vendors might *think they are*.

Taken together, the process area overview diagrams and the Process Listing and Sequence provide a process view of the organization. A process view is a dynamic view of *what* value is delivered by the organization and *how* it is delivered. Viewing the Virtual Lean Enterprise in a process view inevitably highlights cross-functional and cross-enterprise processes for lean improvement.

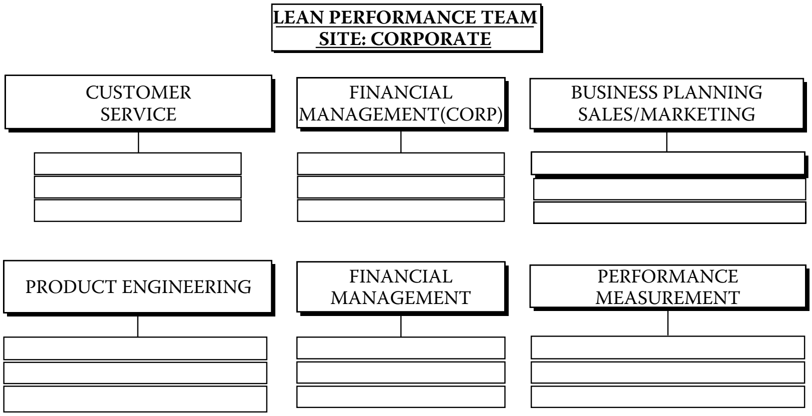


Figure 10.8 Lean Performance Team (Corporate)

Developing Site Teams

Site teams are then defined and illustrated by the site-level project team diagram. Once all processes have a process owner identified, it's easy to determine the site teams and their assignments. All process owners are on the team. Their assignment is to implement their lean improved process.

When Lean Performance site teams are identified, verify project team members and determine assignments for the project. Identify resource personnel for team members. Identify key system operators. Arrange for participation of the project team, resource personnel, and key operators. Estimate and publish time commitments for all. Arrange for project team facilities at each location. Include requirements for terminals, tables, chairs, etc. We have again included our three sites as examples, this time illustrating the teams in Figures 10.8, 10.9, and 10.10.

Developing Lean Performance Team Training

Education and training participation necessary for team members to properly configure and operate the supporting software is defined in conjunction with appropriate resources from the software vendor. Classes and rosters for software education will be developed later in the project. To be successful at Lean Performance, the education and training from the software vendor *must* be completed only after the project team members complete the process requirements definition for their respective processes. To accomplish this, team members need specific team development and process training. This training should be accomplished prior to beginning work on the improvement of processes. The team development training and process improvement training should be conducted by the project trainer and project facilitator, respectively. Schedule and conduct the initial team development training including all team members from all sites.

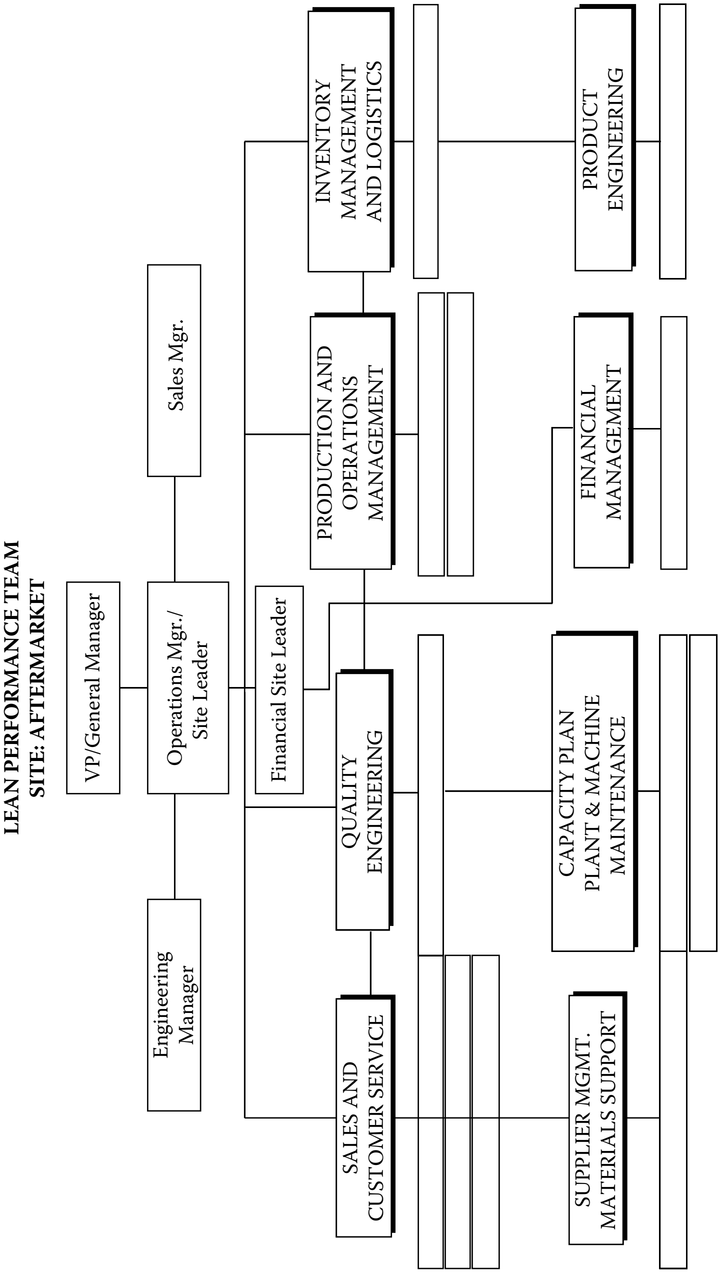


Figure 10.9 Lean Performance Team (Aftermarket)

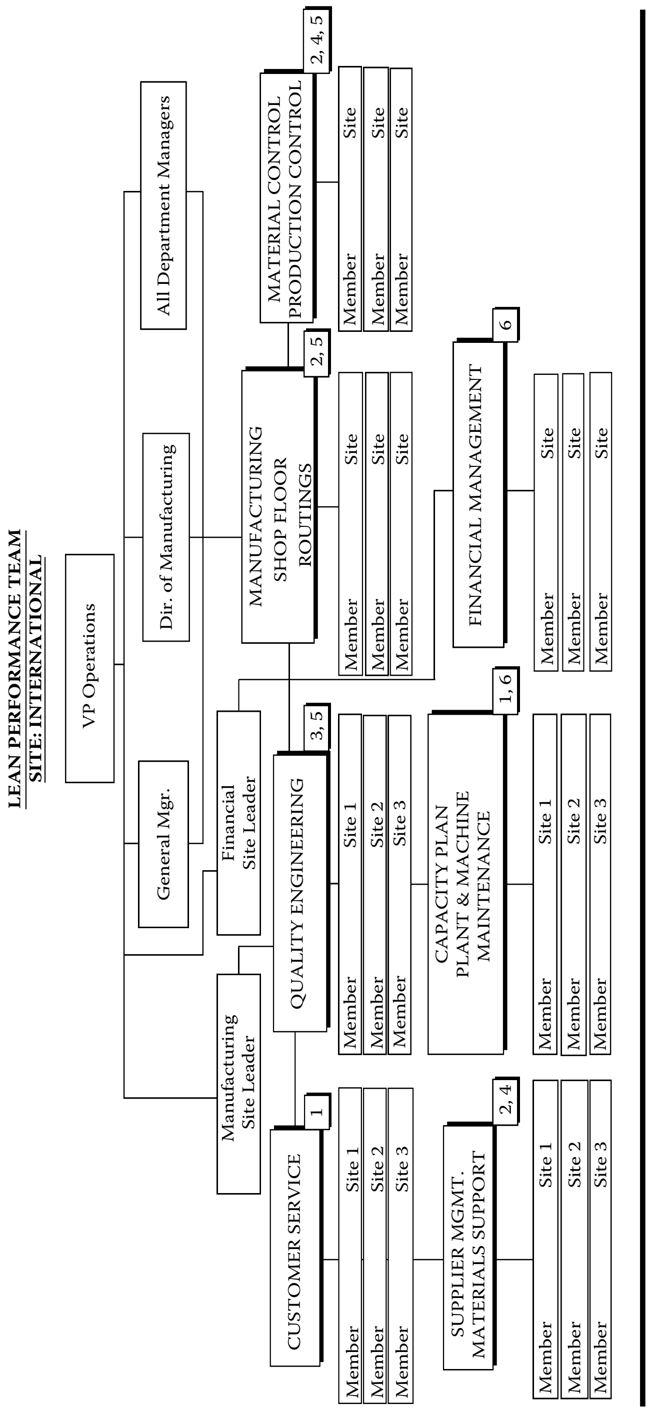


Figure 10.10 Lean Performance Team (International)

In the team development training, train and empower the process experts and customers to take responsibility for enterprise Lean Performance and the Virtual Lean Enterprise. Enable process experts, customers, and information systems support to improve communication and to operate from a process-oriented focus. Provide insight into the use of Process Standards and measurements to manage continuous improvement.

Inform the process experts that the Lean Performance teams have identified common processes across multiple sites, and multiple teams working on common or similar process workflow standards and work instructions will communicate and share work. While sharing process standards work and documentation, teams at each site determine what works best in their process at their site. Above all, impart the message that teams enable shop floor physical process lean improvements to impact upstream. In most manufacturing companies, 85 percent of cost is upstream from shop.

The Lean Performance teams should be made aware that their activities include the establishment and development of site-level project plans, Process Standards, the process workflows and work instructions, software and process GAPs identification, the Open Issues Resolution Process, and the eventual process-level proposed performance measurements.

The project manager should record any systems problems or requirements that are identified during steering committee or team meetings, including team training sessions. The project manager should also complete an evaluation summary for each meeting or training session. The Lean Performance team training will develop the team dynamics for a successful project. Later in the project, additional training will be needed to complete the process improvement training needed by team members.

The team development training should fully cover the "why" level discussion, especially questions concerning the project methodology itself. The orientation message to be delivered goes like this: Traditionally, the IT experts would decide what's best for you and deliver a new system or process and tell you how to operate it. That never works very well. Another way we could go forward would be to bring in outsiders, let them decide how you ought to do processes, and then get the process owners, customers, and users involved to see if the outsiders got it right. We would then make changes where necessary, and deliver to you a new system or process. That is the "user-involved" approach. A third way we could go forward would be to let process experts and customers determine the best way to do the processes and then deliver the new system or process in support of your design. That is the Lean Performance team approach.

On a Lean Performance team, members:

- Are cooperative
- Are mutually respectful
- Are collaborative
- Are dedicated (to the approach)

- Share a vision
- Are Powerful

The process of team development is to start as a group, using outside facilitation, and grow into a self-directing team as the ideal long-range result (no facilitation/assistance required). Our purpose as a team is to last beyond the project.

It is always the decision of the team member whether or not to join the Lean Performance team. Most join because they see the vision, like it, and want to be a part of it. Individuals may or may not see the vision, but would like to participate anyway. Or they may not wish to participate at the time but do so later. It's up to them. Of course, not participating may have adverse job consequences. Lean Performance team members should adhere to the same ground rules as workshop attendees, as discussed in chapter 8.

We begin every team session by reviewing the results of the last session. We will evaluate the session, *not* the performance of individuals. We will explore how each team member feels the session went. We will determine what we as a team did well and propose what we could do better. We will end every team session by reviewing the results of the session.

Again, we evaluate the session, not individual performances. We explore how each team member felt the meeting went and ask what we as a team did well, and not so well. We will attempt to learn what we could do better.

After the orientation, the next important item on the team training agenda is instruction in developing Process Standards. The objectives of the process workflow and work instruction standard development are to develop documentation to help us manage processes with new software and to document those processes consistent with ISO and QS compliance requirements. We also complete process documentation for handoff to other project sites so *our* best processes can be implemented throughout our organization without duplication of effort.

To develop process workflow standards, first the process owner will determine *what* their process does. Only after that will site leaders, facilitators, or the software vendors present software-specific training to demonstrate *how* process requirements are performed by enabling software. Process experts will document the process input/output cycle, adding the who, where, and when information to the process documentation. Process experts will then review the process and its output with the process customer for acceptance.

It's likely that there will be some reluctance to complete the Process Standards on the part of some, if not most or all, of the team members. Completing the Process Standards is beginning to resemble a lot of extra work. Some skeptical team member is bound to ask why we are developing Process Standards for management decision and information/support processes. Here are some answers.

- Standards establish communication. They connect the information systems support and the system users.

- Would we introduce a new machine or process to a physical product process without developing a standard (BOM, routing) for performing the process? Or a standard process cost?

Lean Performance utilizes Process Standards for information/support processes to maximize the use of unmodified, vendor-supported software because vendor-supported software lowers complexity. Less complexity means less downtime for computers, networks, and customers. Cost, quality, and delivery results improve. We have learned the following in the lean factory:

- Process Standards must be established before a process can be stabilized, and a process must be stabilized before technology innovation can be implemented.
- Process Standards are needed to develop process control and checkpoints for measurement and improvement. Again, the lean factory has demonstrated that when process performance is improved, you have improved the process result.
- Process Standards ensure the success of the organization: Standards are needed to protect the company's knowledge base by recording and preserving expertise.
- Process Standards are needed to facilitate cross-training.

The Lean Performance methodology uses Process Standards as a driver in any IT implementation or improvement project. The development and acceptance of a Process Standard precedes development of any modifications. The development of Process Standards focuses the requirements definition on the IT customer, the process owners and operators. In the project, we will define the requirements of our improved processes using the process workflow standard technique at first without references to the software and later with the addition of screen references from the software. Process improvements will be done in sections by small groups, then reviewed and approved in the weekly team meetings. Figures 10.11 and 10.12 illustrate the results of Process Standards work.

Distribute a copy of the Project Control Spreadsheet to all process owners. Instruct the team on how to locate and update the Project Control Spreadsheet on the project Web page. Steering committee reporting will be based in the presentation of graphs developed from team reporting on status of process workflow and work instruction completion. Figure 10.13 is an example of a Project Control Spreadsheet that will support (graphical) visual progress reporting.

Introduce the Lean Performance team meeting mechanics. Clarify that weekly meetings will be held for updates, reviews, and decisions. They are not process improvement working sessions. Working sessions will be in small groups (process experts) held as needed to get work done.

For each team, select a team leader to assume the responsibility to develop an agenda for weekly meetings, reserve a room, and notify team members. The team leader will also conduct weekly meetings, making sure they stay on track, that are

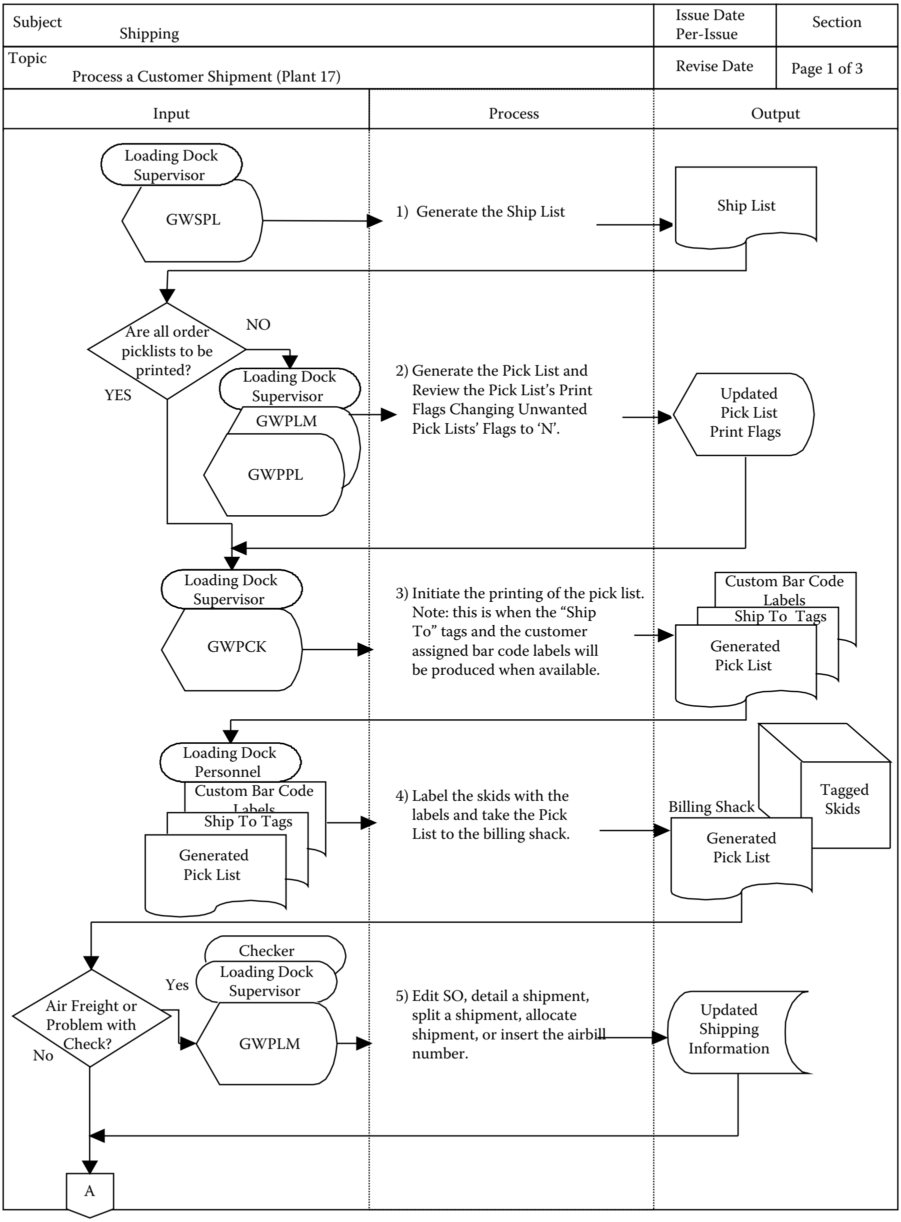


Figure 10.11a Process Workflow Example

assisted by the facilitator, and the team leader will meet with the facilitator after each meeting to review the meeting for ways to improve the next meeting. Team leaders will follow up during the week on progress of small groups toward assigned tasks. In some cases, the team leader assignment may be rotated among team mem-

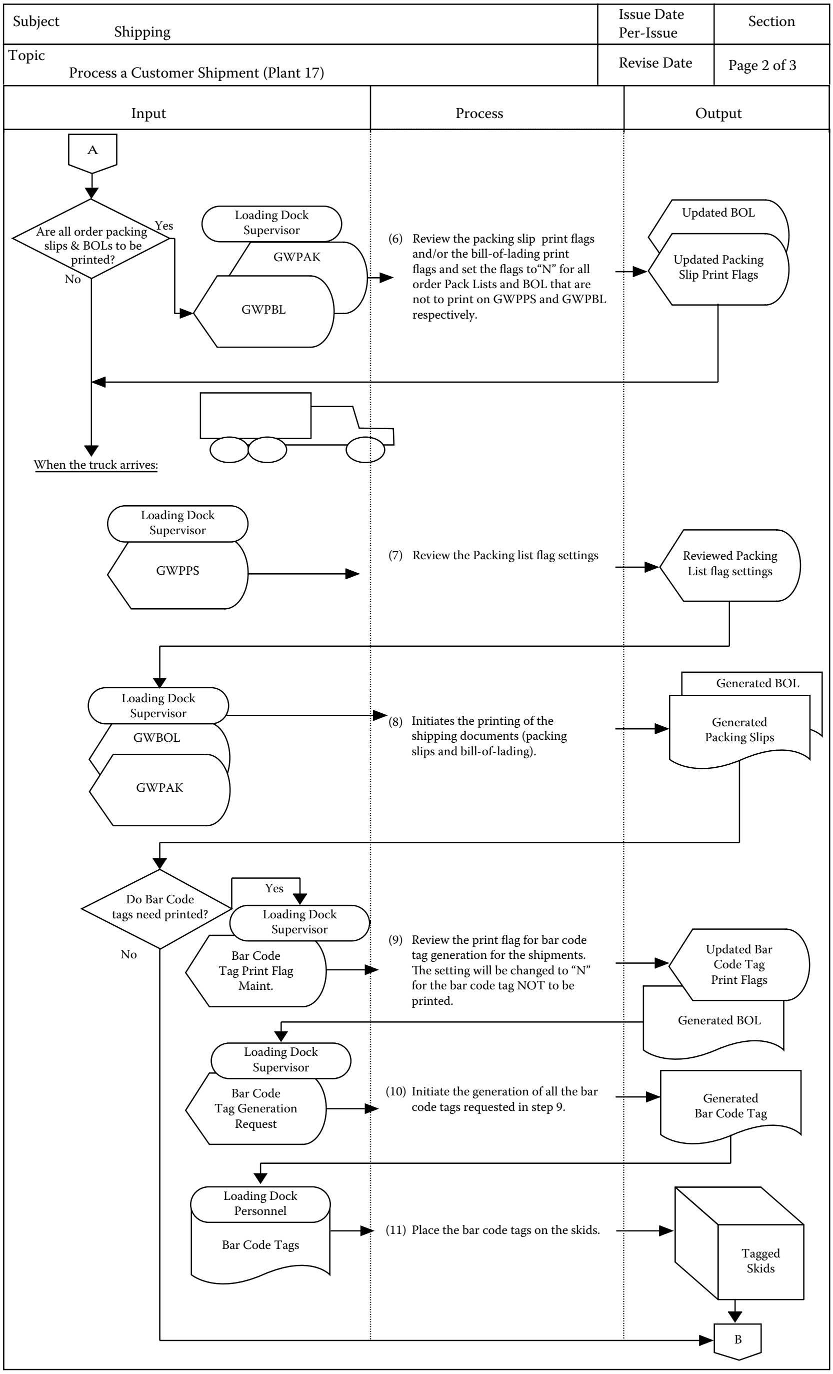


Figure 10.11b (Continued)

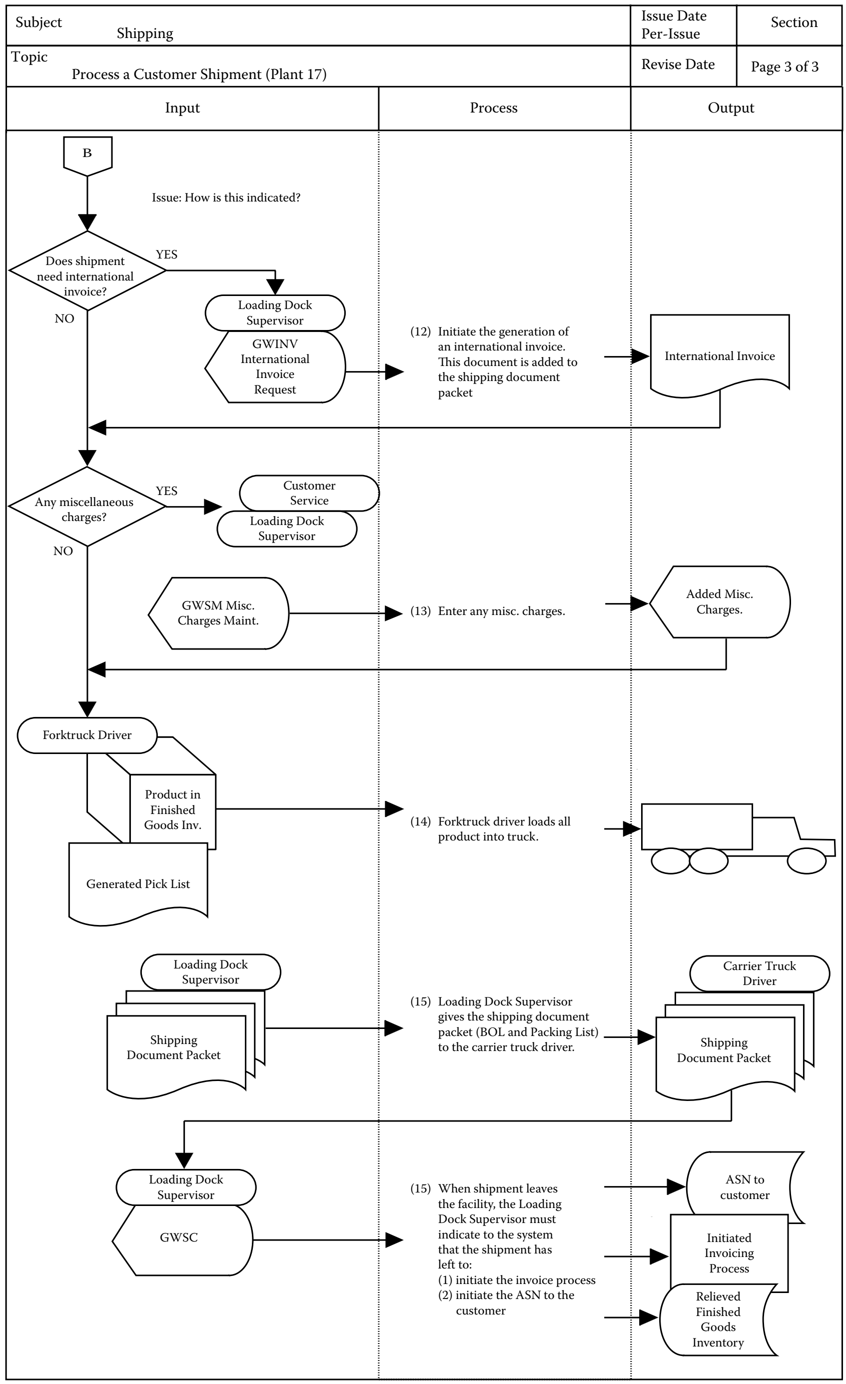


Figure 10.11c (Continued)

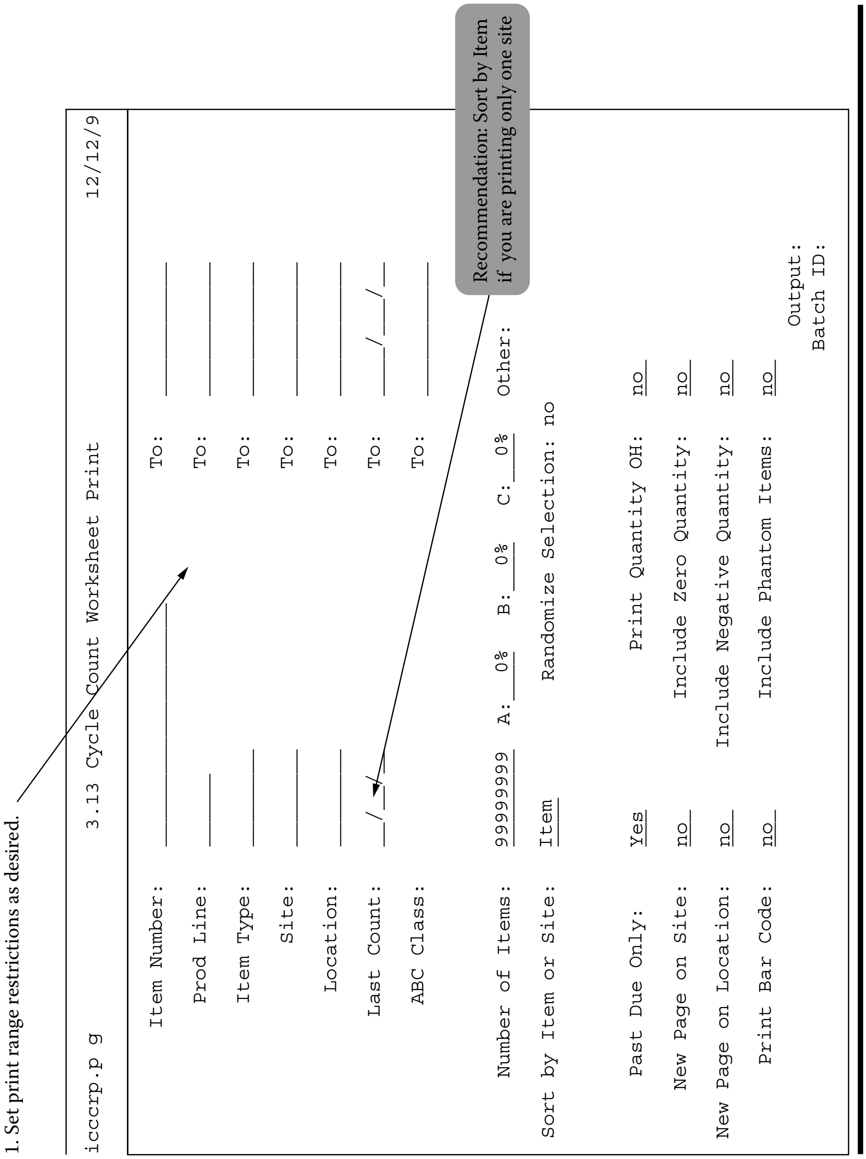


Figure 10.12 Work Instruction How-to Example

PROJECT CONTROL SPREADSHEET

Level							
1	Business Planning					Sales	
2	Analyze Sales History	Analyze Open Orders	Analyze Seasonal Trends	Analyze Other Business Trends	Generate Forecast	Pricing	Analysis
3							
4							
MASTER INDEX NUMBER	1100	1200	1300	1400	1500	2100	2200
APPLICABLE							
WORK							
INSTRUCTIONS							
PRIORITY							
C/S	C	C	C	C	C	C	C
STATUS	O	O	O	O	O	O	O
OPEN	1	1	1	1	1	1	1
ACTIVE							
FLOWED							
MAPPED							
WORK INST							
TESTED							
TOTAL	1	1	1	1	1	1	1

Figure 10.13 Project Control Spreadsheet

bers. There should not be any weekly meeting where decisions are to be made if more than one team member will be absent. Team leaders will hold updates with project management to report team status and progress.

Finally, the teams are empowered to act within the project mission and scope, and also within the parameters of the lean principles. Teams will employ the lean transformation principles in the Lean Performance Analysis. In the project, teams will create or enhance an already existing lean culture, and all team members are empowered to invoke the lean cultural principles during team activities. As a reminder, the lean cultural principles are:

- Process-oriented thinking means what before how.
  - First, understand *what* work needs to be done, then understand *how* to best do the work with a new system.

- Product quality results from process quality.
  - Improved process quality is the focus of the project.
- Every process needs a Process Standard.
  - Without a Process Standard, we can't even agree on what the process is.
- The process owners and operators are the process experts.
  - When in doubt, the process owners and operators carry the discussion.
- The next process is your customer.
  - Of course, the customer can override the process experts when it comes to the output of any process. If the process customer isn't happy with the process output, then the process isn't improved (yet).
- Loyalty to people enables continuous improvement.
  - The golden rule principle is to treat others on the team as you would have them treat you.
- Process data and measurements drive process continuous improvement.
  - Measurements level the playing field of ideas. Better ideas tend to produce better processes, and better processes produce better results.

Reporting Progress to the Steering Committee

The project manager next conducts the Lean Performance Planning Quality Assurance Review. The key report for this review is a progress report for the steering committee utilizing graphs generated by the Project Control Spreadsheet, based on project team process owners' updates. Figures 10.14, 10.15, 10.16, and 10.17 illustrate the type of visual reporting generated by a fairly rudimentary spreadsheet, here using "Primary" and "Secondary" rather than "Organizational" and "Activity" to denote process level.

The project manager should be sure to include updates of all the visual project management tools.

What Follows Lean Performance Planning?

Phase 2 of the Lean Performance methodology is called Lean Performance Improvement. This project phase includes three modules of project tasks to be performed by the teams:

- Improve Process Performance
- Integrate Systems
- Test Improved Processes

The Improve Process Performance module includes these important tasks:

- Developing Process Standards, including workflow and work instructions
- Finalizing and documenting software system controls and codes

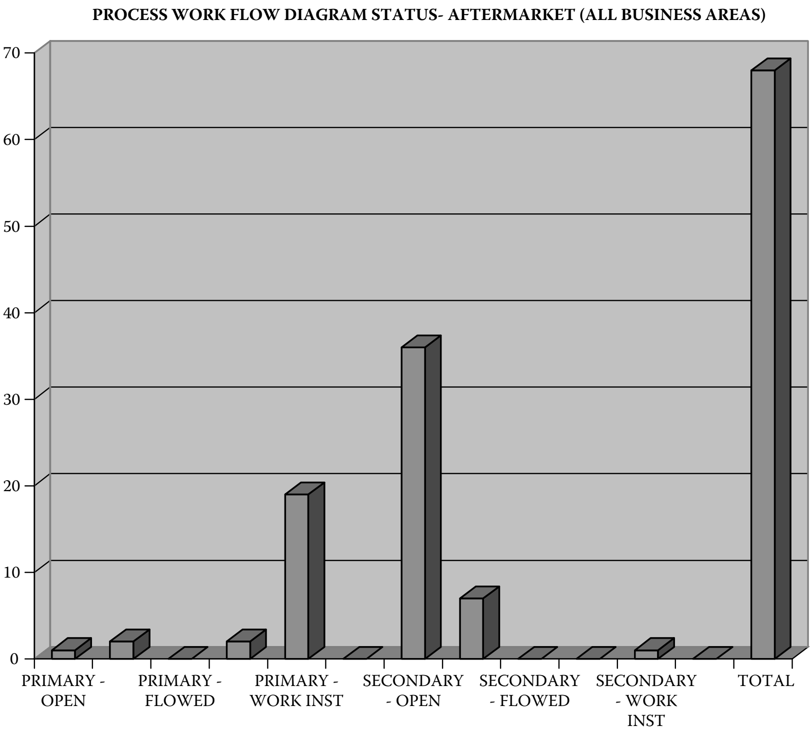


Figure 10.14 Process Workflow Diagram Status for All Process Areas for Aftermarket Site

- The Lean Performance Analysis
- Lean Performance team education

The Integrate Systems module follows. It includes these important tasks:

- Developing software improvements to close process and system GAPs
- Planning, programming, and testing data conversion and software programs
- Installing and testing software and communications capabilities

Project Phase 2 concludes with the Test Improved Processes module, with the following important tasks performed by the teams:

- Developing test procedures
- Prototype and pilot testing
- Process test
- Process workflow/work instruction update
- Conducting the user training program

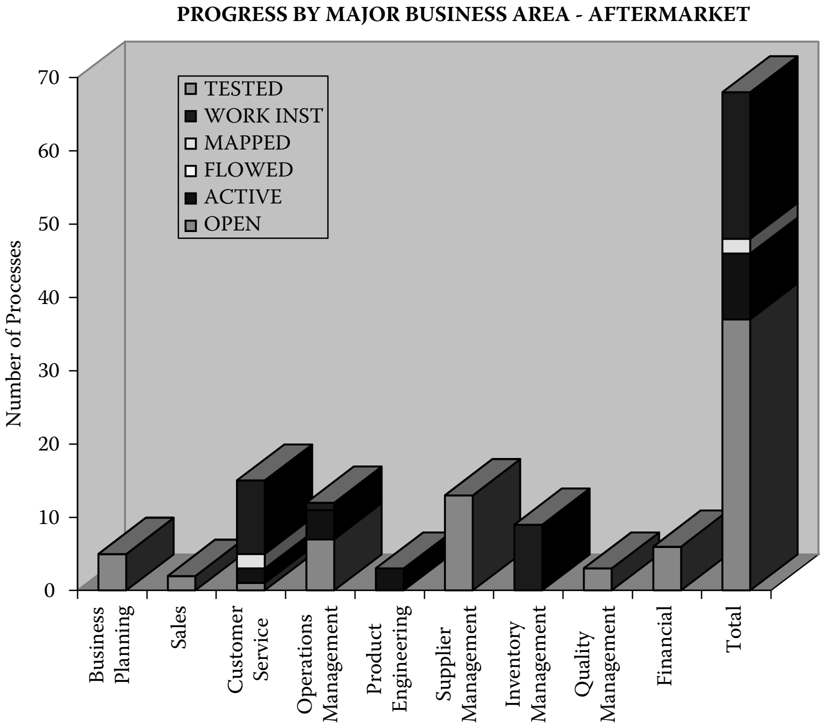


Figure 10.15 Progress by Process Areas for Aftermarket Site

Phase 3 of the Lean Performance methodology is the Continuous Lean Performance phase. This project phase includes two modules of tasks:

- Implementing Improved Processes
- Continuously improving Lean Performance

The Implement Improved Processes module monitors the successful completion of all tasks necessary for process implementation and manages the redefinition of Lean Performance teams for improved process implementation. Important tasks include:

- Maintaining Lean Performance teams
- Implementing Lean Performance Management
- Continuously Deploying Lean Policy and Strategy

The Lean Performance methodology concludes with the Continuously Improve Lean Performance module, which includes defining and initiating Lean Performance measurements:

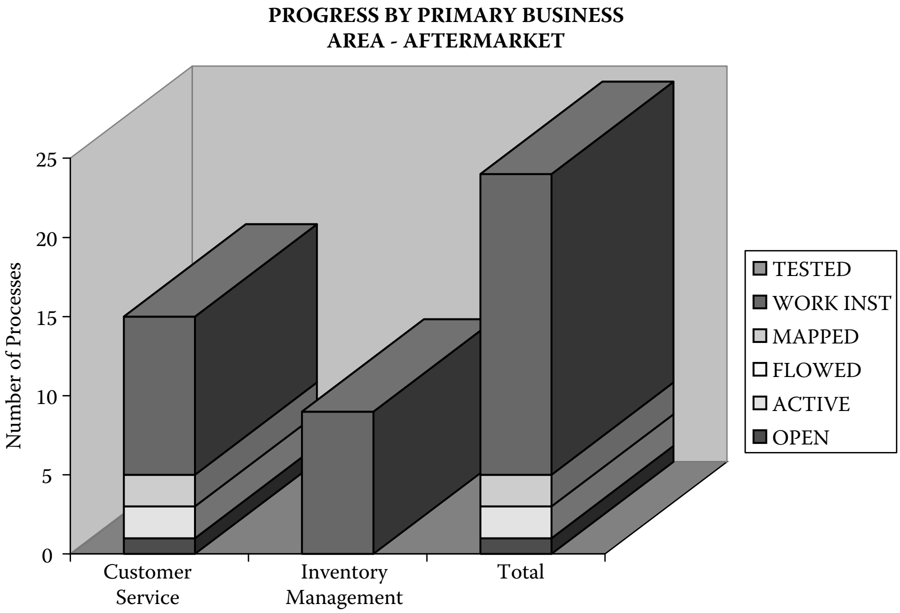


Figure 10.16 Progress by Primary Process Areas for Aftermarket Site

- Ensuring system integrity
- Delivering key management data
- Providing continuous improvement data

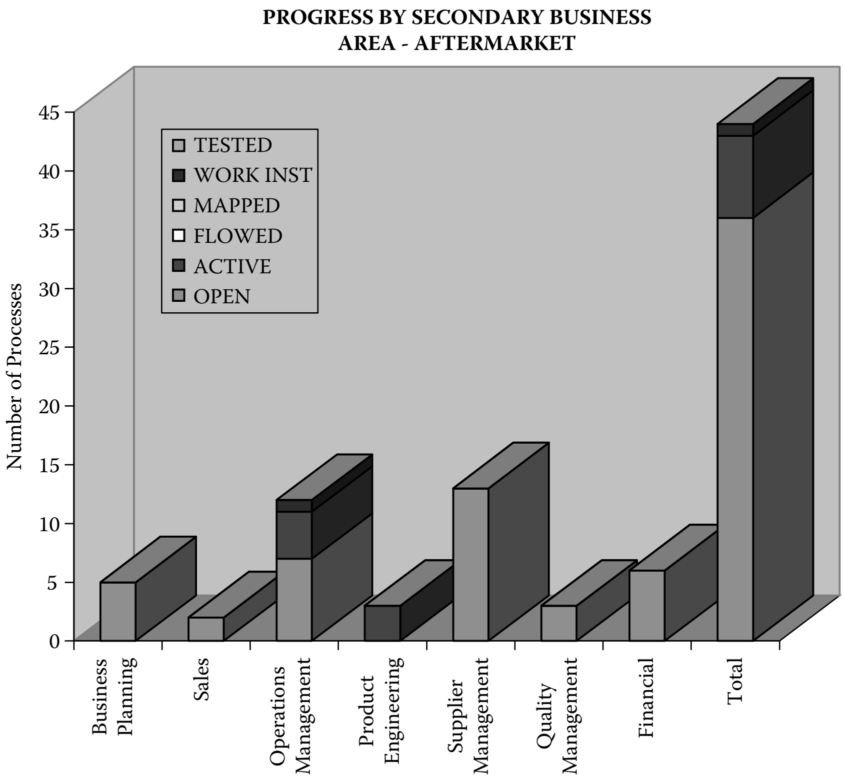


Figure 10.17 Progress by Secondary Process Areas for Aftermarket Site

III

LEAN PERFORMANCE IMPROVEMENT MODULES

In phase 2, the shift from *planning* to improve processes to *actually* improving processes occurs. Processes that need improvement usually reside in departmental silos, although we have taken the first step toward improvement by identifying project processes in process "areas," rather than in departments. We can also consider these processes to be in the process stream or value stream, although we have made the case that value stream organization is not an effective approach to lean transformation, at least not for everybody. These processes are going to be "leaned" into cross-functional and cross-enterprise processes, and at the end of the project they may be in an entirely different process configuration.

Phase 2 should be planned to continue for four to six months. The sequence of processes improved should be:

- Physical processes
- Information/support processes
- Cross-functional processes
- Cross-enterprise processes

Chapter 11

Improving Process Performance Module

Management Tasks

Maintaining Lean Performance Teams

Lean Performance teams are the gathering point for the process expert and customer Process Standards definition activities. There are two types of standards to complete. The first is process workflow standards, which are classic input–task–output flowcharts, historically derived from Taylor and the School of Scientific Management. The second is the process work instruction standard, derived from the initiators of Lean Production in their visual management attributes, but which is also very connected to the information technology system innovation school in that many implementation consultancies use them or something like them to document procedures during implementation. Several of the better ERP software vendors supply a set of system screen work instructions along with their training modules. Often, these are user maintainable. If your site is using a software enabler with this attribute, use it. Beware, however: the prepackaged processes that are also supplied by some vendors. Although a noble attempt, and if user-maintainable frequently handy, they are no substitute for conducting a business-specific (your business-specific) value-added process analysis in order to prepare for implementation.

The majority of the important tasks of the Lean Performance teams are performed in this phase of the project. The first of these is already begun, that being to identify, analyze, and improve processes. The teams will develop the process workflows and work instructions (Process Standards) with process experts and customers, and perform the Lean Performance Analysis.

From a steering committee perspective, it is critical to the eventual success of the project to monitor the project team composition. Once established, the Lean Performance teams will need to be modified from time to time for various reasons, including expanding the scope of the processes being improved, changing personnel or their assignments, the formation of the cross-functional and cross-enterprise teams, and the formation of product- or process-based teams for ongoing Lean Performance Management.

The Lean Performance site and process team leaders and the project manager have the tasks of recommending team changes and designating the members of the cross-functional and cross-enterprise teams. The steering committee has the task of either accepting those recommendations or seeking alternatives.

The membership of the initial Lean Performance cross-functional teams is identified in this project phase, from the following process area teams:

- Finance
- Engineering
- Materials
- Operations
- Information

The next significant change to the Lean Performance team structure also occurs during this project phase. It is the nomination of the members of the Lean Commerce team that occurs as the initial process identification and improvement activities conclude. This team is charged with designing and implementing Lean Commerce processes and the cross-enterprise Virtual Lean Enterprise.

Conducting Steering Committee Meetings

The first report at each phase 2 steering committee meeting should be the report of the project manager on the project progress to plan. Utilizing the project tools presented previously, the project manager should be able to present results of process and progress monitoring, including the summary bar chart and process graphs.

Probably the most important oversight provided by the steering committee is to judge how well the improved processes are performing for the customer, based on performance standards and other expectations. Although there will be a formal audit activity performed on the project results during the final phase of the project, steering committee members represent process areas, and their process area team leaders are responsible to report process lean improvements to them. Steering committee members should also examine records and interview process experts and customers in their process areas to recommend changes and corrections. There is one important caveat, and that is that any time the steering committee or its members interact with the project team on project issues, the Lean Cultural Principles in place within the project team govern, and steering committee members are expected to abide by them. Frankly, not abiding by and endorsing them dooms the project and the eventual adoption of Lean Performance Management. The Lean Cultural Principles are:

- Process-oriented thinking means what before how.
- Product quality results from process quality.
- Every process needs a Process Standard.
- The process owners and operators are the process experts.
- The next process is your customer.
- Loyalty to people enables continuous improvement.
- Process data and measurements drive process continuous improvement.

Regardless of the extent to which employees are empowered to design, redesign, or improve processes, it remains management's responsibility to oversee and ultimately authorize any proposed changes. Carrying out this responsibility includes authorizing expenditures, reviewing proposed operational procedures, and providing for allocation of personnel.

The Lean Performance Analysis is the mechanism that has been deployed by the steering committee to coordinate the design and development of companywide standards for measuring, monitoring, and improving processes. The Lean Performance Analysis is completed by the project team during phase 2, and it is the management tool for further policy and strategy deployment in phase 3. It is the "bottom-up" mechanism for requesting software enhancements and defining and reporting process-level measurements on an ongoing basis.

Project Team Tasks

Lean Performance Team Education

When preparing to organize Lean Performance team education, first ensure that the membership of the teams includes everyone needed to perform team tasks. Be sure that the membership is inclusive, rather than exclusive. These teams are not status or prestige accomplishments in the corporate culture. They need to be working teams, and there is quite a bit of work to be done. Don't exclude the process experts and customers from team membership. They need to be in on the teams from the start, and education is critical to helping team members participate effectively.

The first education activity for team members is to become familiar with what is expected of them in the Lean Performance project itself. Lean Performance team training should educate on this phase of the methodology. Include team members from all locations. Begin by reviewing and confirming all the project plans, diagrams, and reports from the Lean Performance Planning activities just completed. Be sure to cover the project tasks to be accomplished in this section of the workplan as well as the Lean Performance Improvement practices to be employed to accomplish those tasks. The Lean Performance Analysis builds from the already completed identification and deployment of Lean Business Policies, Lean Project Strategies, and the Project Objectives. It also includes:

- Technology Deployment
- Team and Process Identification
- Developing Process Standards
- Identifying process and system GAPs
- Determining solutions for those GAPs
- Identifying benefits and process performance measurements

Early in the Lean Performance Improvement phase, the project manager will issue the Process Standards documentation templates. Be sure to incorporate the columns and headings illustrated in Figures 11.1 and 11.2.

During the Lean Performance Improvement phase, the project manager should occasionally review the Process Listing and Sequence to remove processes eliminated, to identify and include new or missing processes, and to resolve the differences in terminology of the process identifications.

During the Lean Performance team training, the teams should complete several project tasks. One task is to identify vendor software classes to be conducted and rosters of attendees from the Process Listing and Sequence identification of process experts and customers. Schedule the on-site software classes to follow the process requirements definition, when the process value-added *whats* are fully recognized and understood. Schedule information team hardware and software training for attendance prior to experts' other team members, if at all possible. Development of company software expertise is critical to answering the process owners' questions about software support for their processes. The more that is available, the better.

The Lean Performance project manager and the training coordinator should schedule appropriate software education for all Lean Performance teams based on the requirements of their respective processes. A review of the process identifications should provide some insight. Final decisions on attendee rosters can be delayed until the process requirements are understood and documented. Process owners should attend software training with the process requirements portion completed on process workflow standards and should use the classes to begin to complete their decisions and documentation.

An education and training plan should then be developed that incorporates the initial software and hardware competency training into a longer-term plan. The education and training plan is developed by the training coordinator and is

PROCESS WORK FLOW DIAGRAM

PROCESS NAME:	SITE CODE:	INDEX NUMBER:

PROCESS DESCRIPTION:	OWNER:	CUSTOMER:

PAGE NUMBER: 1 OF 1	REVISION LEVEL:	DATE ISSUED:	DATE REVISED:	DATE PRINTED: 5/3/2007

INPUT	PROCESS	OUTPUT

Figure 11.1 Workflow Diagram Template

referred to the steering committee for approval. It becomes the basis of the ongoing company practices in Lean Performance education and training. The education and training plan needs to include training classes, Internet courses, video training, complete rosters, and the sequence and timing of classes. It should include consideration for ongoing competency of personnel, especially transfers and new hires. It should include standards or other techniques to ensure the periodic measuring of

WORK INSTRUCTION

SCREEN NAME:			SITE CODE:	INDEX NUMBER:
PAGE NUMBER: 1 OF 1	REVISION LEVEL:	DATE ISSUED:	DATE REVISED:	DATE PRINTED: 5/3/2007

Figure 11.2 Work Instruction Template

competency and provide for skills updating, especially those demanded by software upgrades and modification.

From a general competency perspective, classes that should be offered include:

- Orientation to Lean Performance ERP and Software Terms (1/2 hour classroom)
- Lean Performance ERP Overview—What Will Lean Performance ERP Do for Me? (1 hour classroom)
- "Getting Started"—What Do I Do to Support Software? (1 hour classroom)
- Keyboard Familiarity—How to Navigate on the System (1/2 hour classroom)
- Train the Trainer for Process Owners (1 hour classroom)
- General System Use and Important Inquiries for All System Users (1 hour classroom)
- Report Generation for Interested System Users (1 hour classroom)

User training and user exercises for performing very specific tasks should be designed and presented just before the "go live" process. This includes task/user process-specific process workflow and work instruction training for system users of processes. The reason for holding off on this for now is that specific training by the facility for plant- or facility-identified processes is enhanced once the teams know the plant common processes. The project trainer should work with the project manager to develop and maintain a spreadsheet to manage and communicate project training schedules, such as Figure 11.3. The training assignments spreadsheet will also be utilized to organize, disseminate, and manage the team and lean education deemed necessary for team members and other process owners and operators during the human resources (HR) team Lean Skills Assessment, conducted next.

Human Resource Team Tasks

It is becoming more and more obvious that the transition from Mass Business Administration (MBA) to Lean Business Administration (LBA) requires a transition in our business educational processes. Many educational institutions, including the University of Illinois at Chicago, offer education on elements of the lean catalog. The steering committee must commit to educate every process owner and operator in lean principles and tools. The steering committee can ensure that all

	A	B	C	D	E	F	G	H	I	J	K	L
1	Last Name	First Name	Plt	D	Phone	New Phone	Dept	Area	Com-pute	Getting Started	MRP Overview	Job Specific
2	Smith	Kelly	1B	7	2490	NTHQ		Admin				
3	Smith	Julie	1F	8	-	N/L		AP/AR Clerk				
4	Smith	Tania	17	7				Bus. Planner		D		
5	Smith	Betty	17	7	3543	3759	1780	Cust. Service				
6	Smith	Melinda	17	7	-			Cust. Service				
7	Smith	George	17	7	2870	3723	1780	Cust. Service				
8	Smith	Vicki	17	7	3893	3893	1780	Cust. Service				
9	Smith	Nancy	17	7	3310	3748	1780	Cust. Service				
10	Smith	Rhonda	1O	7	-	N/L		Data Entry				
11	Smith	Deborah	1O	7	-	N/L		Data Entry				
12	Smith	Cindy	1M	7	2513	6445		EDS Admin		I		
13	Smith	Shay	1E	7				Engr				
14	Smith	Mel	17	7	3284	3744	1762	Engr Indust				
15	Smith	Bill	17	7	3844	3844	1763	Engr Indust		X	X	X
16	Smith	Greg	17	7	3060	3728	9503	Engr Product				
17	Smith	Vickie	1S	7	-	N/L		Engrng				
18	Smith	Jennifer	1F	7	3346	6537	9585	Finance		D		AR/INV
19	Smith	Debbie	1F	7	-	N/L		Finance				
20	Smith	Charlotte	1F	7	2161	6412		Finance	PC			
21	Smith	Jo	1F	7	2854	6490	9585	Finance				
22	Smith	Joan	1F	7	3941	6616	9585	Finance				
23	Smith	Ron	1F	7	2351	6430	9585	Finance		X	X	X
24	Smith	Gene	1F	7	3034	6504	9595	Finance	PC			
25	Smith	Julie	1F	7	2286	6425		Finance		X	X	X
26	Smith	Carol	1F	7	6996	6623	9585	Finance				
27	Smith	Mike	1F	7	3979	6618	9585	Finance				
28	Smith	Chris	42	7	2329	3709		Finance		X	X	X
29	Smith	Kim		7	3992	6619	9585	Finance				
30	Smith	Susie	1F	7	2285	6423		Finance				
31	Smith	Dave	1F	7	2271	6420	9585	Finance				
32	Smith	Angela	1F	7	-	N/L		Finance		D	X	I
33	Smith	Pam	1F	7	3464	6550	9585	Finance		D	X	I
34												
35												
36												
37												
38												

Figure 11.3 Training Assignments Spreadsheet

employees are educated on lean cultural principles at the inception of the Lean Performance project by providing the education necessary on Lean Cultural Principles along with issuing the lean enterprise vision, Lean Performance mission, and scope statements. The HR team executes the steering committee imperatives to manage the education plan for the Lean Performance project.

It is not necessary to educate all process owners and operators on all lean practices. Educate on lean practices where appropriate to the process characteristics for each process owner and process operator. An ERP project manager in the lean champion role depends on the HR team to determine who in the enterprise could benefit from education on lean principles and tools as well as applicable lean practices. Lean practices include work-cell layout, design for one-piece flow, and others.

Just as we take physical inventory to establish our benchmarks, an inventory of the skill sets in the organization must be undertaken. A Lean Skills Assessment will demonstrate who needs education and on what. The HR team must determine which process owners and operators need education on diagnostic tools and practices such as the 5 Ss, material/information flow analysis (MIFA), SMED, etc. The HR team must determine the method and rosters for education on lean cultural and workflow practices, including the creation of a nonblaming, nonjudgmental work environment.

The human resources team is responsible to establish a perpetual skills inventory to ensure skills and knowledge are brought to standard and kept current. A project task that completes a skills inventory of what the organization already knows in the way of lean principles, tools, and practices must avoid the mistake of assuming that a given skill already exists in the operator base. Match your people up from a need-to-know basis. Count the parts and the skills—don't assume they are already there. Finding the people in the enterprise who have current, verified knowledge of and skill in lean tools and practices is the first step in developing the Lean Skills Assessment. The possession of a lean education certificate by a given process owner or operator does not ensure current or relevant skills, especially when education completion was completed more than three years ago. If that is the case it will probably be beneficial to refresh the skills learned.

It is even more beneficial if the person who has the skills can teach others. As the Lean Skills Assessment goes forward, match internal "lean educators" to the teams that will need education. Be sure to align the education offered to the project plan. Simply educating the process owners and operators on lean tools and practices can result in shallow "show" results rather than viable process results that are both measurable as well as aligned to the organization's lean implementation plan. Often too few team members are expert in the lean skills when the initial process lean improvement activities begin.

The final critical component of the Lean Skills Assessment is the translation of skill GAPs into an education plan that ensures that the skills needed to be successful in implementing lean processes are available in the right teams at the right time. If there are not enough process owners and operators with the right lean tool and practice skill sets for the process being implemented, the implementation will stall. Early stall-outs and failures reflect poorly on the steering committee and may discourage further lean activities. The timing for education for team members depends on the sequence of the Lean Performance project plan and its focus of improvement from one phase to the next.

The HR team must also examine the need to provide foundational skills such as building and managing teams and managing meetings. These are relatively easy skills to develop with a modicum of investment for formal education. Establishing a budget for education as part of the lean transformation project can ensure that the skill sets required to support lean transformation are in place. Lean education should pay for itself. When most production organizations look at implementing a lean enterprise, the focus is heavily slanted toward the financial impact of line items such as lowered inventory that will be turned into cash flow. It is a very good idea to

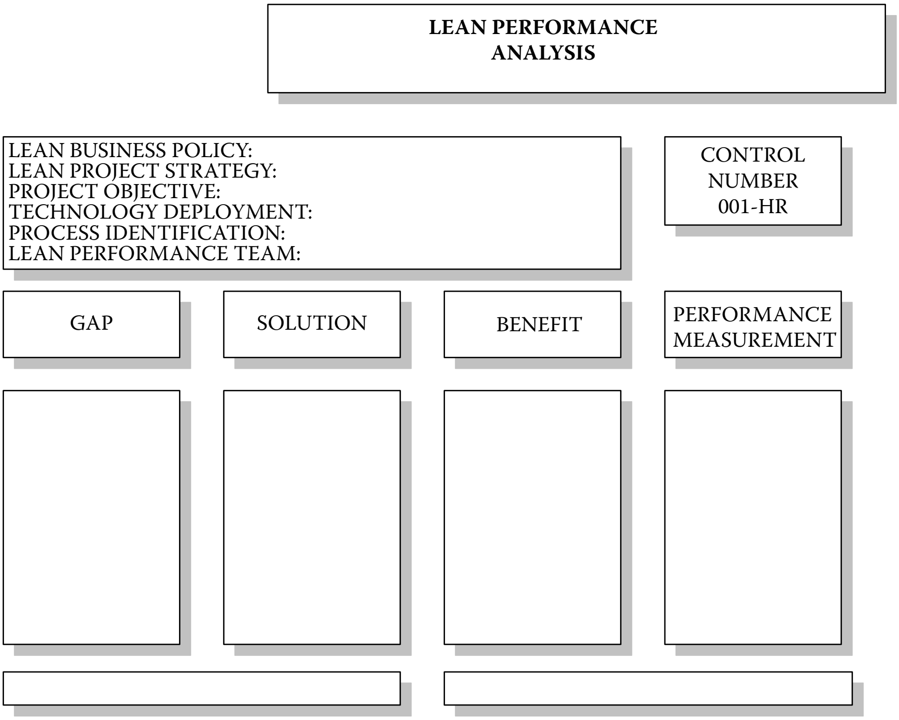


Figure 11.4 Lean Performance Loyalty Analysis Template

establish a "pay as you go" approach to using lean savings from inventory reductions and throughput improvements to pay for education expenses. Some organizations establish strategic targets based on a conservative estimate of how much inventory will be reduced and dollars generated. Some of these dollars can be used to support the "pay as you go" approach to lean education.

If your lean implementation is going slowly or your enterprise doesn't seem to have enough skilled people to implement lean practices, revisit the Lean Skills Assessment and lean education plan. If it isn't in place—or adequate to the task—fix it.

Also, conduct a management policy deployment exercise that asks for suggestions on the following question: What step or steps should we take as an enterprise to value our employees during the coming lean transformation project? Using the Lean Performance format as in Figure 11.4 will help keep the process going in an organized fashion.

The business policy and strategy completed by the steering committee drives policy deployment. Although management defines business policies separately, project strategies are defined by management and project teams. They are completed before project objectives are defined by project team members, including process owners, process customers, and IT support. Examples are Figures 11.5 and 11.6.

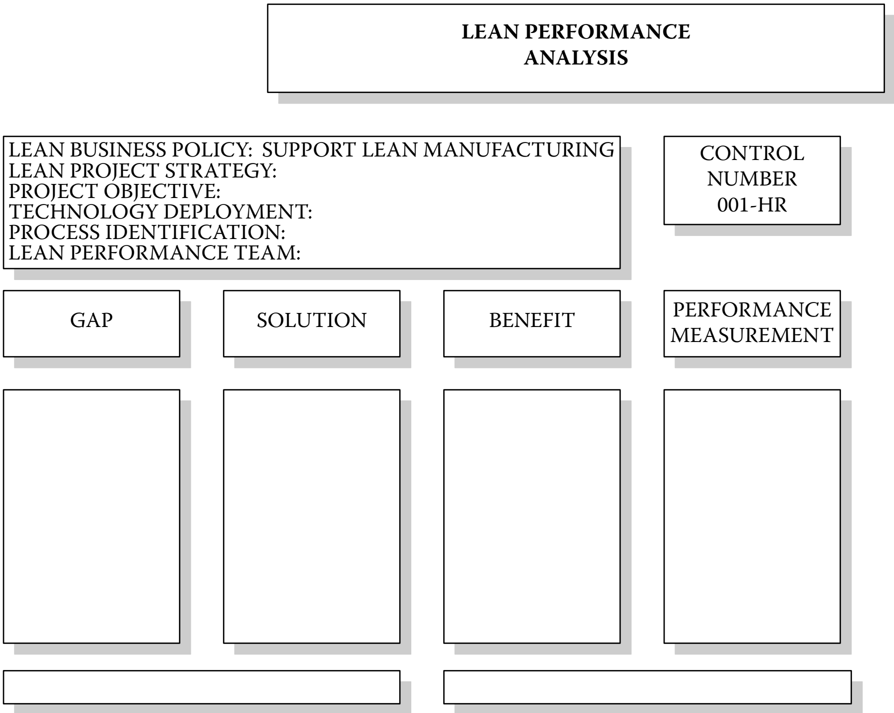


Figure 11.5 Lean Performance Loyalty Analysis—Policy Deployed

Next, each team in the Lean Performance Analysis determines processes where policies can be deployed, benefit measured, and whether software or other process enablers require improvement to meet project objectives. The teams will complete the information needed to deploy the policies to the process level. Determine whether any IT or other technology support is needed, and be sure to involve the IT team. Complete the process identification by asking the teams to respond to the question "Where can this policy be achieved?" Then the process where policy will be realized is selected by any team realizing or implementing to that objective.

With Lean Performance team identity known, the team or teams then investigate the process. They determine if there are any GAPs in performance, and if there are any GAPs in system or other support. They determine solutions to the GAPs, including new policies or enablers, as well as the benefit to adopting the proposed solution.

As in all Lean Performance project deployments, a modification to current systems, machines, or other process enablers is only approved when payback is demonstrated in advance.

Completing the policy deployment activity, the HR team facilitates the teams to define *process* performance measurements. Processes are then implemented, with performance measured by teams and results monitored by management.

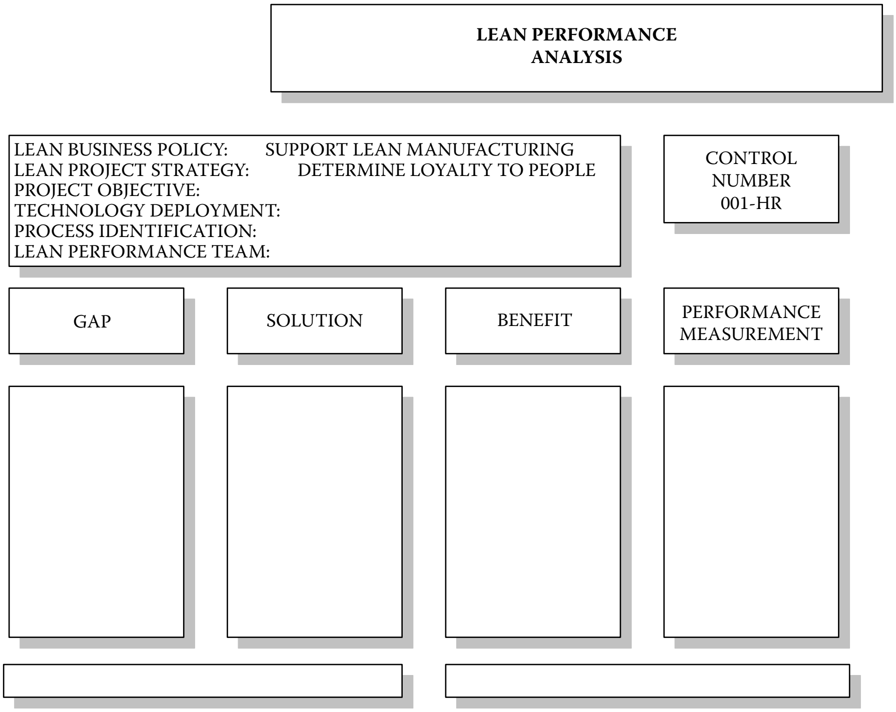


Figure 11.6 Lean Performance Loyalty Analysis—Strategy Deployed

Lean companies continuously deploy lean business policies and strategies. This Lean Performance deployment process links Lean Business Policies, Lean Project Strategies, and Project Objectives to direct the teams and provides the basis for decisions about any necessary software modifications. The Lean Performance deployment process also links management to the eventual performance measurements implemented to monitor the performance of the new lean processes that result from the project.

A simple solution to the problems generated by too much management direction of lean improvement project selection is to develop an employee suggestion system to use as an input to drive future projects. The use of suggestion systems has been derided as a management "flavor of the month" in many companies. This is a failure on the part of management to organize and sustain the effort.

In order to sustain the suggestion box, or suggestion mechanism of whatever sort, all suggestions must be evaluated for potential positive impact on quality, cost, and delivery (QCD) and should be implemented if warranted. A suggestion not implemented for a good reason must be presented before being discarded. A working suggestion system is often the missing ingredient in a lean transformation. When suggestion systems fail, they become a sort of "black hole" that does not produce results. If you want to be lean you must involve all employees in the improvement

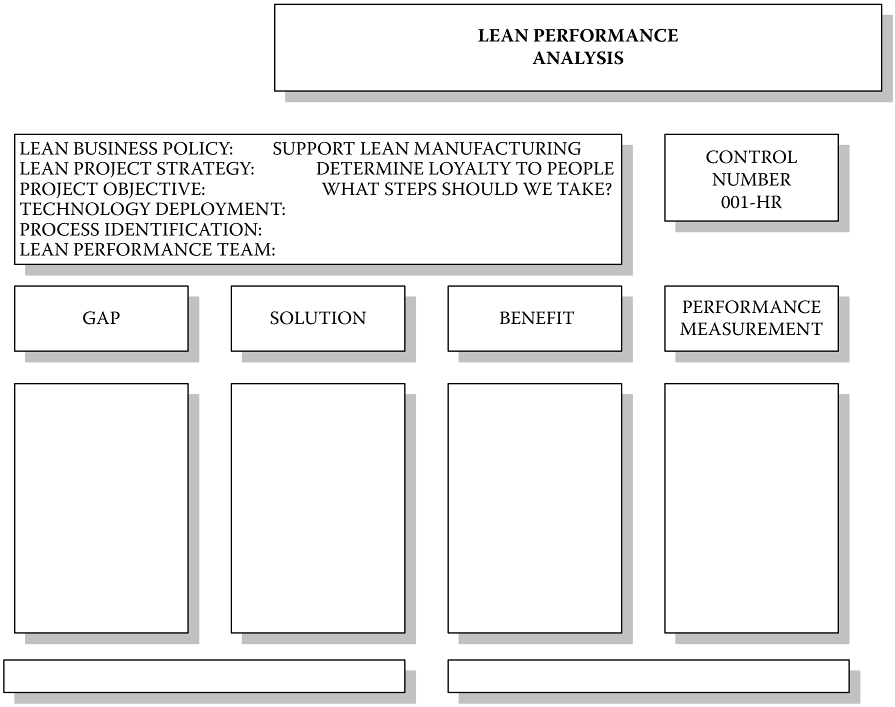


Figure 11.7 Lean Performance Loyalty Analysis—Objective Deployed

process to make it work and the most powerful way to involve employees is through their own creative ideas.

Implementing a suggestion system is the responsibility of the HR team. Here are some suggested system implementation guidelines:

- Provide the support staff to assist the employees to record and implement the viable ideas that are suggested each month, as well as to calculate the costs and savings realized. Human resources and the lean office can provide these support staff from the process owners and operators released from newly lean processes.
- Use QCD savings measured in the suggestion. Emphasize how the suggestion makes the work easier while improving QCD measurements.
- Take advantage of a good suggestion that may apply to another work process by publicizing the suggestion to other team members.
- Address each and every suggestion, as long as the suggestion addresses a process and demonstrates improved measurements in QCD. Ideas that do not address QCD may be viable for the company but do not belong in the QCD suggestion forum.

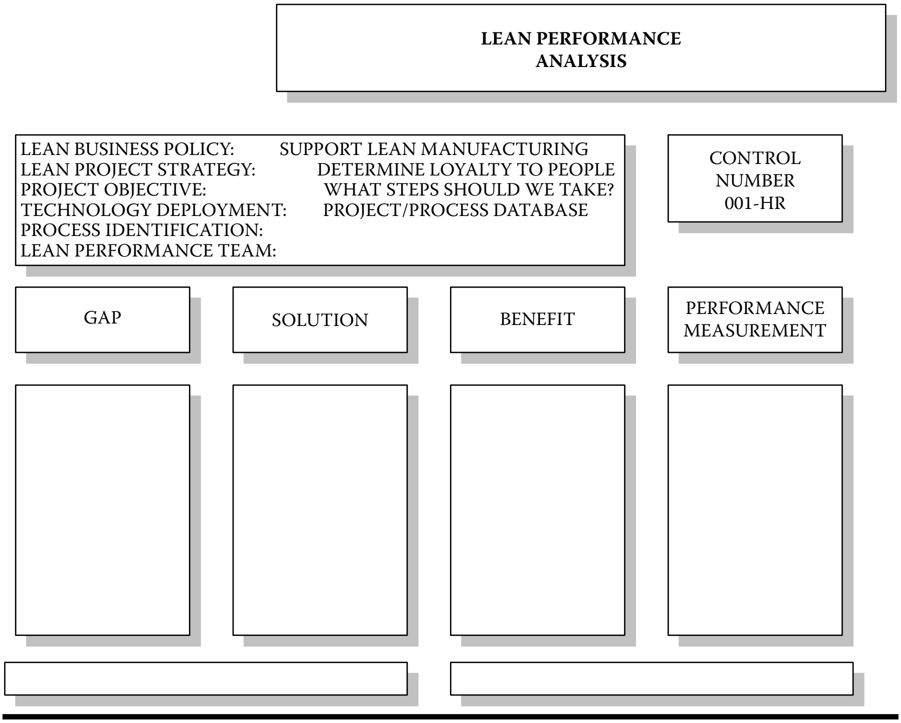


Figure 11.8 Lean Performance Loyalty Analysis—Technology Deployed

W. Edwards Deming proposed that rewarding employees for good suggestions was counterproductive to continuous improvement, as continuous improvement is everyone's job already. Some enterprises do reward suggestions, however. One word of caution here is to award all suggestions implemented (or none) on the same scale. Determine whether the same improvement to each of 20 similar machines, parts, or processes counts as 1 or 20 suggestions before a suggestion of that type is received.

A suggestion system is part of the overall effort to include everyone in the enterprise lean transformation process. Seeking input and leading the process owners and operators to consensus requires the inclusion of representatives from the office staff and the production floor from the beginning. It is a wonderful thing to witness process operators who formerly had been expected to keep their heads down and their mouths shut emerge as key contributors to Lean Performance improvements.

Finally, the three elements to consider when implementing a successful suggestion system are:

1. Line management is responsible to track and measure employee suggestions and improvements as a regular task and to coordinate QCD process Lean Performance measurements.

2. Do not implement any “parallel” structures. Report results only once to combined management/process owner/process operator groups. Remember that everyone has to work with common data in order to find lean process improvements.
3. Working the simple improvements first is important to early harvest of benefits as well as development of lean improvement approaches in your enterprise.

The HR team is also responsible to prepare for the eventuality that supervisory and management layers will fall away as MUDA is removed and processes begin to flow without the former “management” of those processes. Redundant and unnecessary tasks will fall away and jobs will follow, some of them white-collar jobs. The commitment in the lean transformation must be that while processes change, and jobs may change or disappear, people will not be let go because of lean practices. For example, an inventory manager who has spent his or her career managing a large, stagnant pile of material may now have to keep track of a much smaller quantity of much faster turning material. The pace of the flow may increase, or the need to “manage” may decrease. In another case, a production planner whose input to the daily expediting parade may feel replaced by laminated kanban cards directing the flow of material. Effective management of those cards means a massive shift in the production planner job, with the job emphasis swinging more toward material planning, ensuring that the cards are always accurate, accounted for, and for the absolute minimum quantity required to achieve organizational goals. A dual challenge exists here for the HR team—first, it must ensure that the job is correctly described, from a policy perspective, and second it must provide the education opportunity for the employee to successfully transition to the new tasks of the job.

Finance Team Tasks

The finance team is responsible for the activities of process experts and customers in the following process areas:

- Financial Management
- Plant Accounting
- Business Planning

Finance team activities include reviewing project objectives deployed during Lean Performance Planning. All teams will complete appropriate Lean Performance Analysis masters to connect their processes to lean business policies and lean project strategies deployment.

The finance team also determines how to provide all other performance measurements proposed during the Lean Performance Analysis, utilizing only central database-provided data. This task usually involves determining system structural setup issues, such as the financial perspective on database structure.

The finance team conducts a review of system setup criteria, determining how data setup should include product lines or business segment or unit-in-item masters, and how data setup should include standard base account structure to minimize use of reference fields in financial consolidations and enable faster period end reporting with minimum account reconciliation.

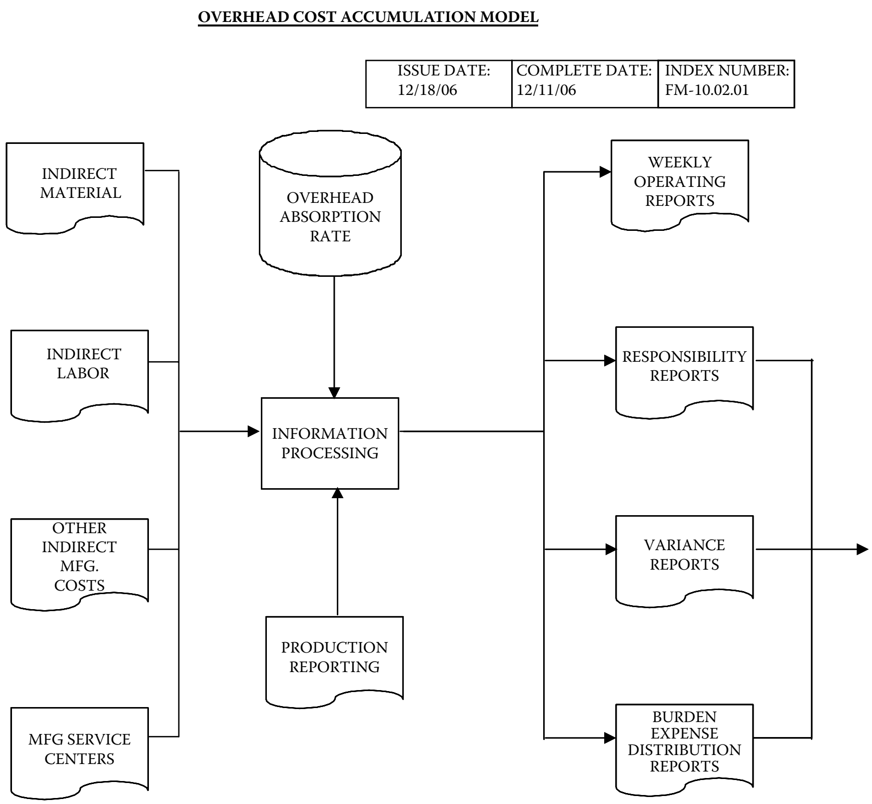
The finance team develops a lean cost accounting process and implementation sequence that initially may utilize an overhead allocation method that allocates corporate and regional costs at the plant-site level to allow appropriate full absorption costing and more accurate and timely reporting of costs, determining use of variable costing and full absorption costing where appropriate. As the lean transformation progresses, these "mass" accounting practices may be eliminated. Transaction controls must not be eliminated until visual financial controls and reporting are developed. An example of an initial overhead-cost model is included as Figure 11.9. The finance team must determine how a transaction matrix will be utilized to eliminate transactions as implementation proceeds, so that full visual and process work costs (standard) can be utilized to maintain current actual process cost for each part, and also to develop visual representations of cost and other reporting data.

The finance team should conduct a review of software package setup requirements and audit the present system for accounting data completeness, accuracy, and effectiveness in costing manufacturing processes. It should verify system files and all accounting data subject to data load or conversion, including work centers, and enter correct accounting data where needed. The finance team should roll up system standard costs and verify that they are accurate, before transitioning to process standard costs (actual). It should determine how to provide financial management performance reporting, ensuring support for level-by-level performance measurements through an appropriate general ledger accounts structure. An example is Figure 11.10.

The finance team should also establish financial entities/sites configuration recommendations to ensure the ability to collect and report financial data according to lean business policies and strategies and project objectives, and include a determination of how to handle entities for joint ventures. See Figure 11.11 for a representative illustration.

Other tasks that can be accomplished by the finance team include the review and establishment of product line designations, the establishment and system setup of exchange rates, and the use of system capability to establish budgets.

The finance team should work with the information team to determine the accounting and financial data conversion strategy. Include steps to map and convert accounting and financial system data with engineering item master data. An accounting data conversion strategy should include an audit of accounting data for completeness, accuracy, and effectiveness in costing actual (process cost)



The overhead cost accumulation overview illustrates how indirect manufacturing costs are accumulated, reports are generated, and the final journal entries are produced to record the absorption or recovery of manufacturing overhead and the charge to make to work-in-process inventories. Overhead costs are accumulated in established departments or cost centers through the coding structure and the normal accounting process of sorting and summarizing transactions.

Figure 11.9 Overhead Cost Accumulation Model

manufacturing processes. The finance team should be prepared to enter accounting data where appropriate and roll up system standard and process actual costs and verify.

Finally, because very often the finance team will tend to be ahead of other teams in its system training, it should not make the final decisions on the use of any system codes that have bearing on other processes. Full Lean Performance team input will be included in final system setup decisions during the Process Test.

Engineering Team Tasks

The engineering team is responsible for the activities of process experts and customers in all engineering process areas. The engineering team is also assigned

DEFAULT SYSTEM ACCOUNTS

ISSUE DATE:	COMPLETE DATE:	INDEX NUMBER:
DRAFT	12/11/06	FM-10.01

The following table lists all of the accounts that are set up in the SYSTEM/ACCOUNT CONTROL FILE

ACCOUNT	TYPE	USE	ACCOUNT
Receivables (AR)	Asset	Invoice Post, AR	01000
Sales	Income	Invoice Post	21000
Sales Discount	Expense	Invoice Post	21010
(Tax) Exempt Sales	Income	Invoice Post (Canadian)	NOT USED
PST	Liability	Invoice Post (Canadian)	NOT USED
Sales Tax 1	Liability	Invoice Post	11611
Sales Tax 2	Liability	Invoice Post	11611
Sales Tax 3	Liability	Invoice Post	11611
Sales Terms (Credit)	Expense	AR Payment	21010
Sales Cash	Asset	AR Payment, AP Checks	00100
Sales Finance	Income	AR	70600
COGS Material	Expense	SO Shipment	30000
COGS Labor	Expense	SO Shipment	31000
COGS Burden (Variable)	Expense	SO Shipment	40000
COGS Overhead (Fixed)	Expense	SO Shipment	40010
COGS Subcontract	Expense	SO Shipment	30010
Payables	Liability	Vouchers, Checks	11000
AP Discount	Income	Checks	70610
Expensed Item Receipt	Expense	Vouchers	42600
Expensed Item Usage Var	Expense	Vouchers	NOT USED

Figure 11.10a General Ledger Accounts

to improve the new product introduction and design and engineering processes described previously. Engineering team activities include reviewing Project Objectives deployed during Lean Performance Planning and the completion of Lean Performance Analysis masters to connect their processes to lean business policies and lean project strategies deployment.

Engineering team activities also include verifying item masters and BOMs (bills of material) to drawings, especially items referenced on drawings as manufactured that may be purchased. The team is also responsible for verifying correlation of system fields in item masters, BOMs, work centers, and routings between new and old enabling software.

The engineering team should propose manufacturing BOMs and routings to the operations and materials Lean Performance teams. By proposing, we mean exactly that. The engineering team has ownership of product data, and many system data management functions depend on product data settings and structures. By proposing manufacturing BOMs and routings to the operations and materials teams, the engineering team is recognizing that, although it may have the system authority to control how system data is established and maintained, it recognizes the value of the input of the process owners who use that system data in the actual manufacture of products. The Lean Performance approach includes the establishment of appropriate handoffs and checks and balances in the development of product structures, while recognizing that the ownership responsibility and maintenance of the BOM

DEFAULT SYSTEM ACCOUNTS

ISSUE DATE:	COMPLETE DATE:	INDEX NUMBER:
DRAFT	12/11/06	FM-10.01

The following table lists all of the accounts that are set up in the SYSTEM/ACCOUNT CONTROL FILE

ACCOUNT	TYPE	USE	ACCOUNT
Expensed Item Rate Var	Expense	Vouchers	NOT USED
Cost of Production	Expense	Non-Prod Labor, SFC Transfer	42000
Labor (Absorbed)	Expense	SFC, Repetitive, WO Close	31200
Burden (Absorbed)	Expense	SFC, Repetitive, WO Close	49800
Inventory	Asset	Inventory Transactions	02000
PO Receipts (Accrued AP)	Liability	PO Receipt, Voucher	11000
Purchases	Expense	PO Receipt (Non-Inventory	42600
Overhead Applied	Expense	PO Receipt	49810
Subcontract	Expense	PO Receipt (If no work order)	46000
Scrap	Expense	WO Receipt	42200
Work-in-Process	Asset	WO, Backflush, Repetitive	02100
Inv Discrep	Expense	Inventory Counts	30210
Cost Revalue	Expense	GL Cost Change	30220
Floor Stock	Expense	WO Close	30280
PO Price Var	Expense	PO Receipt	30230
AP Usage Var	Expense	Voucher	30240
AP Rate Var	Expense	Voucher	30250
Method Variance	Expense	WO Close	30260
Transfer Variance	Expense	Multisite Transaction	30270
Material Usage Var	Expense	WO Close	30241

Figure 11.10b (Continued)

DEFAULT SYSTEM ACCOUNTS

ISSUE DATE:	COMPLETE DATE:	INDEX NUMBER:
DRAFT	12/11/06	FM-10.01

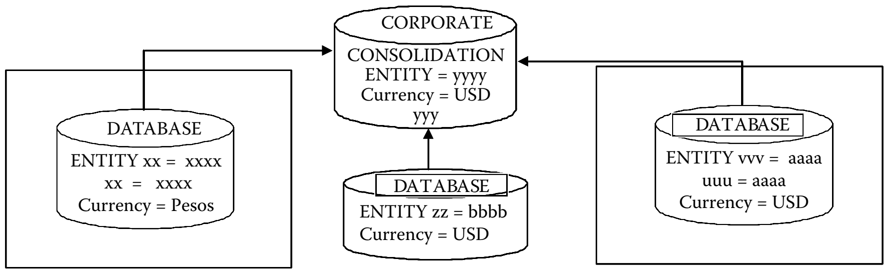
The following table lists all of the accounts that are set up in the SYSTEM/ACCOUNT CONTROL FILE

ACCOUNT	TYPE	USE	ACCOUNT
Material Rate Var	Expense	WO Issue, WO Close	30251
Labor Usage Var	Expense	SFC, Repetitive, WO Receipt	31240
Labor Rate Var	Expense	SFC, Repetitive,	31250
Burden Usage Var	Expense	SFC, Repetitive, WO Receipt	49840
Burden Rate Var	Expense	SFC, Repetitive	49850
Subcontract Usage Var	Expense	WO Close	30242
Subcontract Rate Var	Expense	WO Close	30252

Figure 11.10c (Continued)

and routing standards properly belongs to engineering. Reciprocally, the operations and materials teams are responsible to communicate through the use of these BOM and routing standards as they establish system operations and transactions. The materials team and operations team also produce their own standard (the MIFA diagrams) to learn, communicate, and manage the flow of product and corresponding system transactions.

Data-Base Financial Entities



1. Can setup one database for each site and separate financials for each entity
2. Sites 1 and 2 are in one database, separated by entity code.
3. Site 3 in a separate database.
4. Financials consolidated at Corporate
5. Can use alphanumeric characters or all numeric to identify, entities and sites
6. Each entity can have its own financials
- Income Statement, Balance Sheet
7. We can share common master files
   - i.e, Customer files, Vendor files
8. The field size is 4 characters
1st field represents the division = assigned by corporate
2nd field represents the geographic area = assigned by corporate
3rd and 4th fields will be assigned by the respective sites

Figure 11.11 Database Financial Entities

Ownership and management of system data used by other process owners includes the responsibility to abide by the lean cultural principles, one of which is "the next process is your customer." The engineering team has several tasks to perform in order to ensure that all downstream customers of system data receive or have access to adequate and accurate data. Adequate and accurate in this context implies "quality." Data maintained in processes owned by the engineering team drives many other processes downstream, and quality data is as important to the satisfaction of the external customer as quality materials or physical processing of those materials. To ensure the quality of system product data, the engineering team should audit engineering BOMs for completeness, accuracy, and manufacturing effectiveness. It should copy the engineering BOM to the manufacturing BOM data area in the software, when that is needed, or enter the manufacturing BOM where needed. The engineering team should audit manufacturing routings for completeness, accuracy, and effectiveness in supporting manufacturing processes, and copy or enter routings to the new software where needed.

It is usually appropriate to assign the ownership of the item master file to the engineering team, because it generally is the first to enter part-identified data into the system, as well as additional necessary product data into the system for all sites. It ensures the accuracy and completeness of system product data and determines team ownership of the engineering BOM as well as determines usage of product codes in the item master. Another issue of ownership that must be settled by the engineering team is that of determining design engineering questions such as the local or central "ownership" of product drawings, or governance of product drawings maintained off-site from the engineering location. The engineering team is also responsible for communicating policy decisions on these and other relevant engineering team items to the greater project team.

The engineering team should work with the information team to develop a plan to convert system fields in item master, engineering BOMs, work centers, and routings to the new system. It should also develop a plan to input necessary additional product data information.

A key issue for the engineering team on many projects is to determine how item masters and engineering BOMs will be downloaded or otherwise made available to the appropriate manufacturing site or sites when released for production. In addition to this issue, the team will often need to determine the engineering data conversion strategy, including a plan to map and convert engineering data along with other needed system data, and policies and processes to maintain the product data after the system is live. Often, an engineering data maintenance policy is issued to clarify and communicate that, for example, the item master is maintained by the engineering drawing "owner," and that central or perhaps corporate product engineering "owns" the item master file. In this case, item masters are downloaded or otherwise made available to a manufacturing site on release of the product for manufacture. Correspondingly, in this example, central or corporate product engineering "owns" the engineering BOM and communicates that policy, along with the process to make engineering BOMs available to the manufacturing sites via download, or other transmission, on release.

Project Result: Preliminary Bills of Material and Routings

Materials Team Tasks

The materials team is responsible for the activities of process owners and customers in the following process areas:

- Customer Relationship Management
- Sales and Marketing
- Inventory Management and logistics
- Supplier Management
- Purchasing

The first materials team activity is to review Project Objectives deployed during Lean Performance Planning. As with the other teams, the materials team should complete appropriate Lean Performance Analysis masters to connect its processes to lean business policies and lean project strategies deployment.

The materials team should also review and verify relevant system files, including those containing materials planning data, vendor master data, and price and customer master data that are subject to data load and conversion.

The most challenging task that the materials team should complete is to develop an overview diagram of each manufacturing and warehouse facility, one that includes a representation of all physical material movement and storage. This MIFA diagram will be the standard for discussions and decisions on a wide range of questions and issues and is a further use of the visual management practices of Lean Production, modified to include the purposes of data and information/support process integration. The MIFA diagram will include:

- Work centers
- Work cells
- Assembly lines
- QC inspection areas
- QC hold areas
- QC test areas
- Shipping
- Component staging
- Vendor returns
- Component storage
- Receiving purchased materials
- Receiving outside operations materials
- Customer returns
- WIP staging, racks, lanes
- Finished goods storage, racks, lanes
- Pull locations, racks, lanes
- Scrap areas
- Rework areas
- Shipping lanes
- Docks

The materials team should include on the MIFA diagram the sequence of production activity and material moves for all products, product lines, and production lines. The materials team should complete the material information flow analysis by verifying one complete BOM and routing for each major product. To complete this important task, the team should begin with the finish point of the product and "pull" through final assembly, assembly, subassemblies, and raw material until the complete product structure is accounted for.

Utilizing material movement labels, the team should identify all material consumption, staging, and storage points in the flow by work center or line. Team members should verify locations required for material support and illustrate all material storage, staging, and consumption by warehouse, location, and work center or line. Using material movement indicators, team members should highlight any material queues and label all pull locations or lanes. Care should be taken to highlight stocking levels, paypoints, checkpoints, and backflush points. Figure 11.12 shows an example of the type of diagram that should be produced.

Recommended transaction points should be labeled on the diagram, documenting the necessary system transactions. Note product flow cycle times in shifts and days. Figure 11.13 provides an example.

Operations Team Tasks

The operations team is responsible for the activities of process owners and operators in the production and operations management, maintenance, and quality process areas. The operations team's goal is to improve the previously described maintenance and quality management processes as well.

As with the other teams, operations team activities include reviewing Project Objectives deployed during Lean Performance Planning and completing appropriate Lean Performance Analysis masters to connect their processes to lean business policies and lean project strategies deployment.

The operations team should begin by reviewing BOMs, routings, and material flow, utilizing the handoff of proposed BOMs and routings from the engineering team, and proposed material flow documented by the materials team. Using these preliminary standards, the operations team should analyze product flow, backflush, and use of paypoints for accuracy and adequacy to the actual flow of production. The team should illustrate any process tasks or conditions that are based on or are the results of decisions taken due to plant layout or other physical limitations. If desired, team members can recommend new layouts where they might be beneficial.

Team members should identify and correct any WIP conditions where material is issued, consumed, or moved for longer than a shift or day without a controlling backflush transaction. Team members should also illustrate any condition where material moves more than one work center without controlling backflush or paypoint, unless this material flow is continuous and without interruption. If flow is not continuous, the teams should develop improvement suggestions, researching and testing their implications until a resolution is achieved.

Project Result: Final Bills of Material and Routings

The operations team should also validate the representation of material storage, staging, and consumption by warehouse, location, and work center or line on the MIFA diagrams. Team members should validate the material movement indicators on the MIFA diagrams to verify that all locations required for material support are included. Team members should add or delete locations where required.

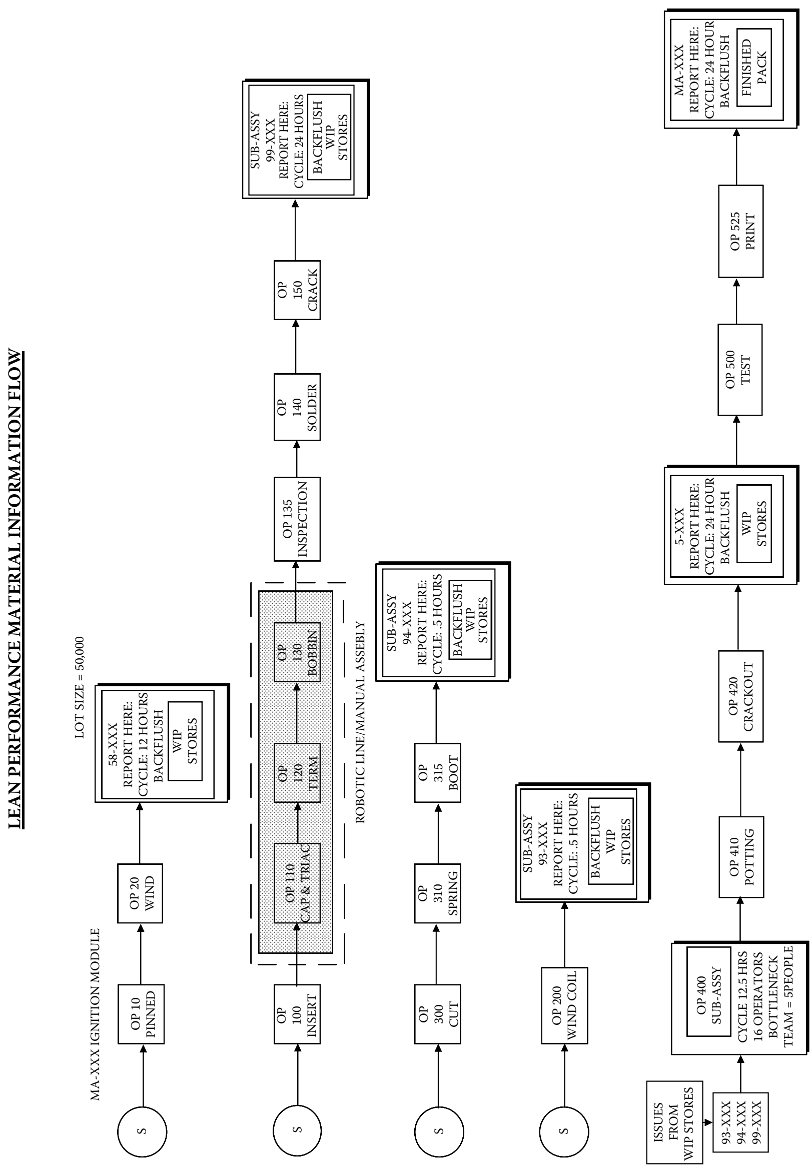


Figure 11.12 Material Information Flow Analysis Diagram

MATERIAL INFORMATION FLOW TRANSACTIONS

#	DESCRIPTION	TRANSACTION	FLOW RATE
1	Receive Raw Material, Components, and Sub-assemblies from Suppliers, Outside Process, or Outside Sub-assembly Department.	Receipt to Stock Location.	80 per hour
2	Production Reporting Of Finished Field Coil Sub-Assembly By Pieces. Link To Final Assembly Schedule.	Routing Paypoint. Backflush Raw Materials.	80 per hour
3	Production Reporting of Finished Outer Frames By Standard Pallet Load.	Routing Paypoint. Backflush Frame From Storage.	80 per hour
4	Production Reporting of Pole Face, Shift Levers, Lams, Comms And Commutator Ends	Routing Paypoint. Backflush Raw Materials.	80 per hour
5	Receive Bar Stock.	Purchased Receipt to Stock.	80 per hour
6	Issue Bar Stock to Production.	Material Issue to Production.	80 per hour
7	Production Reporting of Clutch and Pinion Assembly.	Routing Paypoint. Backflush Components.	80 per hour
8	Production Reporting of Frame Assembly.	Routing Paypoint. Backflush Components.	80 per hour
9	Production Reporting of Brush.	Routing Paypoint. Backflush Raw Material.	80 per hour
10	Production Reporting of Powder Metal Inner Frame.	Routing Paypoint. Backflush Raw Material.	80 per hour
11	Production Reporting of Shell and Pinion. Send to Outside	Routing Paypoint. Report Scrap. Operation.	80 per hour
12	Receive Shell and Pinion from Outside Operation.	Receive to Stock.	80 per hour
13	Production Reporting of Shaft. Send To Outside Operation.	Routing Paypoint. Report Scrap.	80 per hour
14	Receive Shaft From Outside Operation.	Receive to Stock.	80 per hour
15	Production Reporting of Armature Assembly.	Routing Paypoint. Backflush Components.	80 per hour
16	Production Reporting of Completed Housings.	Routing Paypoint. Backflush Components.	80 per hour
17	Final Assembly and Paint.	Routing Paypoint. Backflush Components. FG to Stock.	80 per hour
18	Shipment to Customer.	FG Deduction from Stock.	80 per hour

Figure 11.13 Material Information Flow Analysis Transactions

Project Result: Final Material Information Flow Diagrams

Project Result: Final Material Information Flow Analysis Transactions

Information Team Tasks

One of the more important information team tasks is to plan the data conversion strategy. Working with the finance and engineering teams, the information team should consider mapping and converting financial and accounting data with engineering item master data, wherever possible, and automating the data load wherever practical. Early on in the planning of the data conversion, the information team should verify the database configuration, considering a database for simulations and planning and ensuring that, if necessary, multisite product planning and sourcing can be performed. Consultation with the materials team should provide insight into those issues. The data conversion plan should also define postimplementation system data policy and processes, including real-time data updates and local ownership of processes wherever possible. The data conversion plan should also determine appropriate data export/import and transfer capability between databases after system implementation, especially for special cases like product designed in one region (data entity) but manufactured in another region (data entity). The information team should consult with the project trainer and facilitator to determine the use of the database for training, including periodic refreshes of data and use of data in system testing.

The information team has the responsibility to also verify the findings of the finance, engineering, and materials teams concerning system files subject to data load and conversion. This pertains to all engineering data, including item masters, BOMs and routings, all finance and accounting data including work centers, and all materials data including planning data and vendor masters.

The information team should map all system fields in item masters, BOMs, work centers and routings, planning data, customer and vendor masters, etc., for conversion. The information team also verifies basic system capabilities and compatibility. It identifies any required data elements that are not provided in the standard software. The information team also obtains agreement from other teams and establishes structure and use of numbering conventions for implementation, including customer numbers, part numbers, drawing numbers, vendor numbers, and all other system numbering conventions. Needless to say, this can turn into a project in itself. A recommendation here is to avoid the use of significant numbering schemes at all costs. In fact, this is a good time to revisit the use of numbering schemes, in light of the data search capabilities of today's systems, and consider scrapping outdated numbering significance schemes.

The information team should review any and all team code definitions and recommend revisions where necessary. It should verify any and all team-recommended requirements to assign values to available system fields and resolve use of alphanumeric capabilities. It also finalizes an ongoing training and education process to support the technical aspects of the software and hardware.

The information team is responsible for all system integration tasks, including customer data, EDI, XML, SOAP, FAX, and others. It also coordinates the establishment of systems communications capability and all hardware and software setup. There is more on this topic below, later in the project cycle.

As with the other teams, information team activities include reviewing all lean policies and strategies deployed by the steering committee through the Lean Performance Analysis. The information team provides input to accomplish Project

Objectives by leveraging its knowledge of new system capabilities and providing suggestions to all other teams about the use of new technologies available.

The information team adds input to the Lean Performance Analysis by completing the information system deployment area of the Lean Performance Analysis masters. The goal here is for information team members who are specialists in software support to add knowledge of specific software capability in support of management strategies and objectives. In this way, we hope to leverage team members' knowledge of existing business processes and their insights into how new technologies might improve those processes. Information system deployment defines information systems functionality sought or needed by team members (system users) to achieve the Project Objectives. Technologies must link to the lean policies and strategies deployed by the steering committee. Essentially, IT deployment provides the basis for completion of the Lean Performance Analysis. Participation in policy deployment enables information technical expertise to benefit the project by demonstrating the practical use of new system capabilities to address lean policies and strategies. In this way, information team members point the way to other teams to consider the use of new technologies in their processes. When the Lean Performance Analysis is deployed, information system deployment is accomplished by the information systems support engineers reviewing the deployed project strategies and suggesting new or improved system capabilities that they have obtained or discovered in the enabling software (ERP, MES, OPS, CRM, SCM) already present in the business or available to the project. The information systems support engineers tend to have more familiarity with new and available system capabilities, and their deployment assists the process experts to take best advantage of the new system tools at a process level. Later, during the Lean Performance Analysis GAP exercise, information team members' input will be critical in suggesting software improvements to close documented system GAPs as they arise.

For example, to support a deployed Lean Business Policy to *support lean manufacturing*, with a deployed Lean Project Strategy of *reducing manufacturing inventory*, generating a Project Objective to *eliminate the returned goods storeroom,* technology deployment might be to *utilize online credit capability of software.* This is illustrated in Figure 11.14.

The appropriate process team reviewing the Lean Performance Analysis technology deployment would then match this new tool at the process level to see if it could incorporate system capability support at a process level, for whatever process it feels is appropriate. The Lean Performance Analysis masters are distributed to the project teams, who review the technology deployments, and identify their process and team where appropriate. In our example, the aftermarket operations team determines that the fuel pump return process is a viable candidate for online credit capability.

We will revisit the Lean Performance Analysis masters and provide a summary report for the steering committee early in the Lean Performance Analysis below. At this point, the masters should be distributed to all project team members for

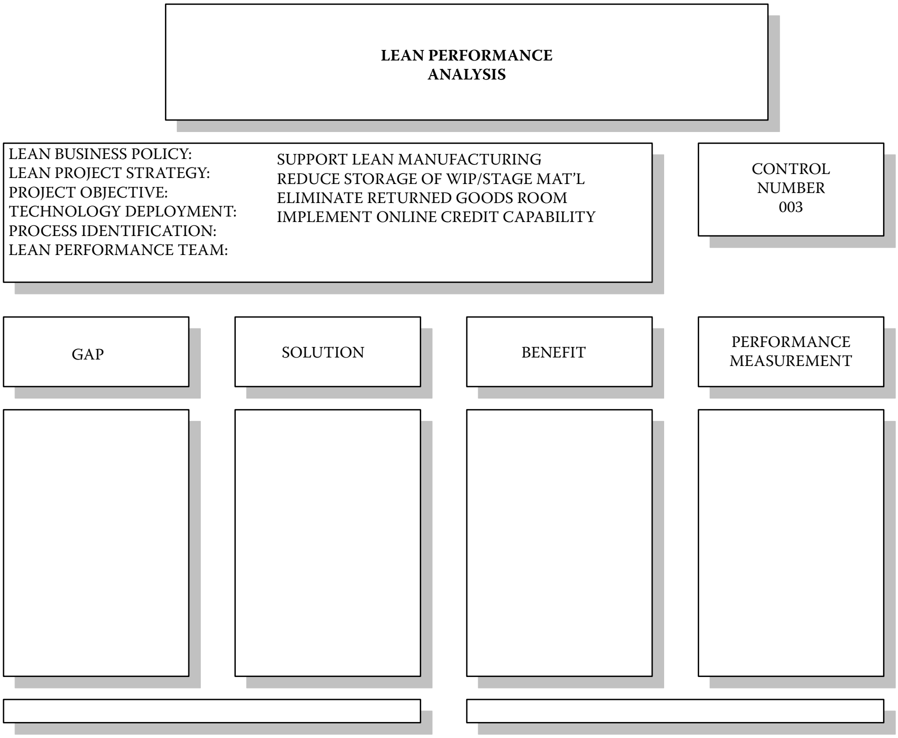


Figure 11.14 Lean Performance Analysis—Technology Deployed

review and identification of appropriate processes and teams. Figure 11.15 summarizes the technology deployment examples that correlate to our earlier Lean Business Policies, Lean Project Strategies, and Project Objectives examples illustrated in Figure 7.8.

Information team activities also include managing data conversion activities and managing system enhancements, where supported by Lean Performance Analysis and approved by the steering committee. I will discuss another information team responsibility: performing and administering the Stress Test below.

Lean Commerce Team Tasks

The Lean Commerce approach derives much of its power to supply the materials to manufacture what the customer wants, when he or she wants it, from an integrated approach to products, product structures, and data systems. As the Process Test and eventual system live dates draw nearer, confidence in full-system integrated functionality becomes more critical. A preliminary process is necessary to determine the validity of critical EDI/XML/SOAP and system programs and transactions affecting customer order recognition, order processing, and shipping,

POLICY DEPLOYMENT AND MEASUREMENTS SUMMARY							
GAP CONTROL#	LEAN BUSINESS POLICY	LEAN PROJECT STRATEGY	DEPLOYED PROJECT OBJECTIVE	TECHNOLOGY DEPLOYMENT	PROCESS IDENTIFICATION	LEAN PERFORMANCE TEAM	PERFORMANCE MEASUREMENT
001	Support Lean Manufacturing	Reduce Manufacturing Lead Time	Implement 24 Hour Turnaround of Customer Orders	Use System Capability to Generates Pick/pack lists Throughout the day.			
002	Support Lean Manufacturing	Reduce Manufacturing Inventory	Implement "Pull" Supplier Management Practices	Set the Item Master to Create Commodity Order Recommendations at Quantity/price Break Chosen			
003	Support Lean Manufacturing	Reduce Manufacturing Inventory	Eliminate Returned Goods Storeroom.	Utilize on-line Credit Capability of Software			
004	Support Lean Manufacturing	Implement Flexibility for Low Volume Products	, Implement Manufacturing Line Sequencing	Utilize System Capability to Sequence Models and Variations within a Model on all Lines.			
005	Support Lean Manufacturing	Implement Flexibility for Low Volume Products	Implement Multi-plant sourcing of Finished Goods.	Implement Multi-plant MPS Capability, Including Capacity Simulations			
006	Support Lean Manufacturing	Implement Flexibility for Low Volume Products	Implement EDI/XML or other E-Commerce Solution for Interplant Orders	Use Messaging Feature to Notify Placement of Multiplant Requirements Immediately			
007	Support Lean Manufacturing	Implement Supplier Partnerships and Certification	Implement Pay-on-receipt Process for Vendors	Allow Vendors Access Into Delivery and Schedule Screens to Manage JIT Deliveries			
008	Support Lean Manufacturing	Implement Activity Based Costing	Establish Product Target Costing/ MUDA Free Product Target Costs.	Establish Simulation Costing Database for Development of Additional Cost Data			

Figure 11.15a Policy Deployment and Measurements Summary—Technology Deployed

including ASNs. These lean commerce team activities are necessary to validate customer-sensitive system results and to develop and perform data and logic testing where needed, on critical customer-facing processes. It may be necessary to design, develop, test, and implement additional system processes and capabilities where

POLICY DEPLOYMENT AND MEASUREMENTS SUMMARY

GAP CONTROL#	LEAN BUSINESS POLICY	LEAN PROJECT STRATEGY	DEPLOYED PROJECT OBJECTIVE	TECHNOLOGY DEPLOYMENT	PROCESS IDENTIFICATION	LEAN PERFORMANCE TEAM	PERFORMANCE MEASUREMENT
009	Support Lean Manufacturing	Implement Process Integrated Document Tools	Implement Bar Coding for Plant Documents	System Can Be Set up to Print Readable Part#'s on Orders and Pick Lists			
010	Support Lean Manufacturing	Implement Process Integrated Bar Coding	Implement Bar Coding for Customer Requirements:	Use System Capability to Scan Confirm Shipment, Scan Shipping Charges, and Produce Labels			
011	Support Lean Thinking In the Global Standardization of Engineering Processes	Design and Utilize Concurrent Engineering Processes	Provide Access to Engineering Product Data at the Manufacturing Sites.	Use System Capability to Support on-line Real-time Access at all Sites, at all Times			
012	Support Lean Thinking In the Global Standardization of Engineering Processes	Provide A Standard Software Format for Engineering Product Data Management	Implement a Standard Software Package for Engineering Product data Management	Investigate 3rd Party and Interface Options Utilizing System Data for Item Master, BOM, Routing etc.			
013	Support Lean Thinking In the Global Standardization of Financial Processes	Implement Central Cash Management	Determine and Accommodate Financial Requirements of Canada, Europe (EU, VAT), Asia.	Bolt-on 3rd Party Capability in Place for Project use			
014	Support Lean Thinking In the Global Standardization of Financial Processes	Implement Central Cash Management	Include Currency Considerations	Can utilize System settings Configured to Example Attached.			
015	Support Lean Thinking In the Global Standardization of Financial Processes	Implement Centralized Integrated Processing of Period Financial Closings	Consolidate Regional Financial Statements	Reports Should be Hard-coded to Utilize Data Available.			
016	Support Lean Thinking In the Global Standardization of Financial Processes	Implement Centralized Integrated Processing of Period Financial Closings	Consolidate Global Financial Statements	Reports Should be Hard-coded to Utilize Data Available.			

Figure 11.15b (Continued)

required to achieve valid EDI/XML/SOAP data and to enhance customer-facing processes. If this proves to be so, it becomes a project priority.

The lean commerce team will review and expand the use of lean principles, tools, and practices across all the business processes in the company, now that the team members have a wide experience of lean applications as well as familiarity

POLICY DEPLOYMENT AND MEASUREMENTS SUMMARY

GAP CONTROL#	LEAN BUSINESS POLICY	LEAN PROJECT STRATEGY	DEPLOYED PROJECT OBJECTIVE	TECHNOLOGY DEPLOYMENT	PROCESS IDENTIFICATION	LEAN PERFORMANCE TEAM	PERFORMANCE MEASUREMENT
017	Support Lean Thinking In the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Develop Global Standard Reporting Formats.	Refer to Steering Committee for Design of Reports			
018	Support Lean Thinking In the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Monitor, Evaluate and Report Product Line and Manufacturing Site Profitability.	Refer to Steering Committee for Design of Reports			
019	Support Lean Thinking In the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Develop Period-To-Date Reporting, Including Regional Sales, Margins and Trends.	Refer to Steering Committee for Design of Reports			
020	Support Lean Thinking In the Global Standardization of Information Systems Management	Implement Global Standard Hardware and Software	Implement Unmodified Software Packages	Modify Open Issue Approvals Only			
021	Support Lean Thinking In the Global Standardization of Information Systems Management	Implement Global Standard Hardware and Software	Leverage Vendor Supplied Software Upgrades	Maintain Simulation Database to Apply Upgrades and 3rd Party			
022	Support Lean Thinking In the Global Standardization of Information Systems Management	Implement Global Information Technology Processes and Organization	Implement secure Data & Operations Processes in a System that is Seamless to the Users.	Utilize a systems management tool for all operations changes			
023	Support Lean Thinking In the Global Standardization of Information Systems Management	Implement Global Information Technology Processes and Organization	Implement Standards for Systems Uptime & Reliability & Measure & Report Performance	Identify all Data and Systems Operations Processes for Measurement			
024							

Figure 11.15c (Continued)

with the capabilities of the new software to support the improved processes. This is especially applicable to environments where a best-of-breed solution is being leveraged, and multiple vendors and packages have to be utilized in single or related cross-functional and eventual cross-enterprise processes. After testing, the lean commerce team will design new processes for utilizing EDI/XML/SOAP data for production planning and master scheduling to incorporate Lean Production smoothing and advanced production scheduling (APS) techniques. The lean commerce team should design new processes for customer data management where needed, including customer masters, pricing (including retroactive pricing) contracts, and order management data. It should design new processes for customer order entry through shipping, where needed, and evaluate packaged software alternatives to existing EDI/XML/SOAP systems and prepare cost analyses for any additional capability sought. A comparison of package cost alternative to the cost of enhancing the current system should be completed, prior to any purchase, although all things being equal it is almost always best to let the vendors supply the software. In order to evaluate a new package effectively, or to go forward with the current approach, there should be an education process during which EDI/XML/SOAP processing for manufacturing would be illustrated. Benchmarking should be utilized to validate comparable processes in other similar businesses if possible. A project planning activity should then be performed, during which team assignments are defined. This should be followed by the assessment. Depending on the results of the assessment process, the team will either proceed with improvements to the existing system, or implement a new package, with any additional improvements, that the team had defined.

The lean commerce team should then assess the scheduling processes in each plant, evaluating each process in terms of overall effectiveness and efficiencies. Following the assessment, the lean commerce team should then design the lean improvements and new processes according to assessment findings. The team should develop the requirements for implementing the model, concentrating on product structure, policy development, processes and training, and recommend the information system capabilities required. The lean commerce team should then build the improvements, define an implementation plan, and implement. This process could be performed one plant at a time but would probably be more efficient if performed for all plants as one project when the plants are interdependent or building the same or similar products. This is especially true from a material planning standpoint, and the desirability of developing new information systems capabilities from a uniform and complete design.

Next, the lean commerce team should concentrate on shop floor improvements, primarily pull systems. The initial team goal should be to define a specific area of a specific plant and build an effective "model." The requirements for implementing the model can then be identified, with operations, material, and system implications defined. The team should then build an implementation plan and implement.

Members of the lean commerce team should include the process area coordinators and appropriate support from all process areas, including finance, engineering, materials, operations, and information teams. The final activity for the lean commerce team is to define the usage of system codes and develop the final system control file configuration. This is best performed during the Process Test, later in

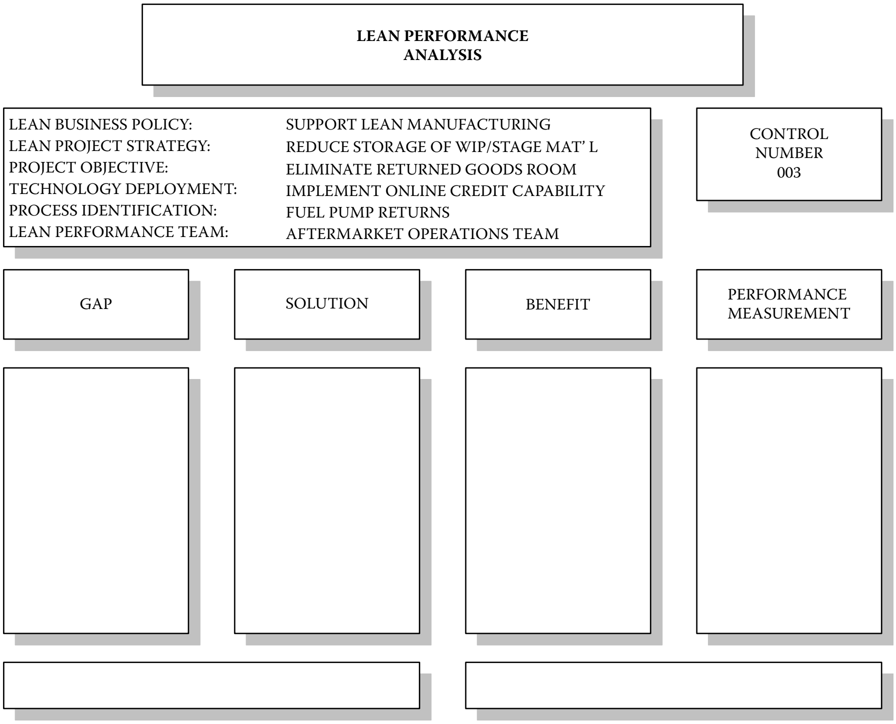


Figure 11.16 Lean Performance Analysis—Process and Team Identified

the project, when all process owners have had the opportunity to work with the software.

Completing Lean Performance Analysis

Lean Performance Analysis tasks are the heart of the Lean Performance project. Every task that has preceded this one has been a preparation for it. Each team should submit its selected Lean Performance Analysis masters prior to the session for team distribution. See Figure 11.16 for an illustration. The project manager should also distribute the summary status at this time. See Figure 11.17 for an example.

Completing Lean Performance Analysis throughout the enterprise means that the teams improve all processes, produce process workflow and work instruction standards, identify all process or system GAPs, document a solution to those GAPs, document the benefit to be obtained by implementing the new process or solution, and define a performance measurement for the new process solution. This is a fairly tall order. Before we describe the Lean Performance practices to accomplish that tall order, let's step back a bit.

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001	Support Lean Manufacturing	Reduce Manufacturing Lead Time	Implement 24 Hour Turnaround of Customer Orders	Use System Capability to Generates Pick/Pack Lists Throughout the Day.	Customer Order Processing	Materials Team	
002	Support Lean Manufacturing	Reduce Manufacturing Inventory	Implement "Pull" Supplier Management Practices	Set the Item Master to Create Commodity Order Recommendations at Quantity/Price Break Chosen	Vendor Order Management	Materials Team	
003	Support Lean Manufacturing	Reduce Manufacturing Inventory	Eliminate Returned goods Storeroom.	Utilize on-line Credit Capability of Software	Fuel Pump Returns	Aftermarket Operations Team	
004	Support Lean Manufacturing	Implement Flexibility for Low Volume Products	, Implement Manufacturing Line Sequencing	Utilize System Capability to Sequence Models and Variations within a Model on all Lines.	Injector Line Management	Injector Operations Team	
005	Support Lean Manufacturing	Implement Flexibility for Low Volume Products	Implement Multi-Plant Sourcing of Finished Goods.	Implement multi-Plant MPS Capability, Including Capacity Simulations	Advanced Production Placement	Materials Team	
006	Support Lean Manufacturing	Implement Flexibility for Low Volume Products	Implement EDI/ XML or other E-Commerce Solution for Interplant orders	Use Messaging Feature to Notify Placement of Multiplant Requirements Immediately	Advanced Production Placement	Materials Team	
007	Support Lean Manufacturing	Implement Supplier Partnerships and Certification	Implement a Pay-on-receipt Process for Vendors	Allow Vendors Access Into Delivery and Schedule Screens to Manage JIT Deliveries	Vendor Order Management	Materials Team	
008	Support Lean Manufacturing	Implement Activity Based Costing	Establish Product Target Costing/ MUDA Free Product Target Costs.	Establish Simulation Costing Database for Development of Additional Cost Data	Customer Order Quoting	Materials Team	

Figure 11.17a Policy Deployment and Measurements Summary—Process and Team Identified

Before a process can be improved, it must be identified and diagnosed (analyzed). This is not often done systematically for several reasons. Perhaps the most prevalent reason is the denial of the existence of process problems, often in defense

POLICY DEPLOYMENT AND MEASUREMENTS SUMMARY

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009	Support Lean Manufacturing	Implement Process Integrated Document Tools	Implement Bar Coding for Plant Documents	System Can be Set up to Print Readable Part#'s on Orders and Pick Lists	Manufacturing Order Management	Operations Team	
010	Support Lean Manufacturing	Implement Process Integrated Bar Coding	Implement Bar Coding for Customer Requirements:	Use system Capability to Scan Confirm Shipment, Scan Shipping Charges, and Produce Labels	Customer Order Management	Materials Management	
011	Support Lean Thinking in the Global Standardization of Engineering Processes	Design and Utilize Concurrent Engineering Processes	Provide Access to Engineering Product Data at the Manufacturing Sites.	Use system Capability to Support on-line Real-time Access at all Sites, at all Times	New Product Introduction	Engineering Team	
012	Support Lean Thinking in the Global Standardization of Engineering Processes	Provide A Standard Software Format for Engineering Product Data Management	Implement a Standard software Package for Engineering Product Data Management	Investigate 3rd Party and Interface Options Utilizing system Data for Item Master, BOM, Routing etc.	New Product Introduction	Engineering Team	
013	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Central Cash Management	Determine and Accommodate Financial Requirements of Canada, Europe (EU, VAT), Asia.	Bolt-on 3rd party Capability in Place for Project Use	Accounts Receivable	Finance Team	
014	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Central Cash Management	Include Currency Considerations	Can Utilize System Settings Configured to Example Attached	Accounts Receivable	Finance Team	
015	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Processing of Period Financial Closings	Consolidate Regional Financial Statements	Reports should be Hard-coded to Utilize Data Available	Financial Statement Reports Processing	Finance Team	
016	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Processing of Period Financial Closings	Consolidate Global Financial Statements	Reports should be Hard-coded to Utilize Data Available	Financial Statement Reports Processing	Finance Team	

Figure 11.17b (Continued)

of process owners or process-owning departments. There is also often a tendency to move directly to a solution (which is often inappropriate, or at best a quick fix). Lack of knowledge about operations or problem areas, or lack of knowledge about systematic problem identification and diagnosis techniques, can also lead

POLICY DEPLOYMENT AND MEASUREMENTS SUMMARY

GAP CONTROL#	LEAN BUSINESS POLICY	LEAN PROJECT STRATEGY	DEPLOYED PROJECT OBJECTIVE	TECHNOLOGY DEPLOYMENT	PROCESS IDENTIFICATION	LEAN PERFORMANCE TEAM	PERFORMANCE MEASUREMENT
017	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Develop Global Standard Reporting Formats	Refer to Steering Committee for Design of Reports	Business Plan Performance Status	Finance Team	
018	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Monitor, Evaluate and Report Product Line and Manufacturing Site Profitability	Refer to Steering Committee for Design of Reports	Business Plan Performance Status	Finance Team	
019	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Develop Period-To-Date Reporting, including Regional Sales, Margins and Trends	Refer to Steering Committee for Design of Reports	Business Plan Performance Status	Finance Team	
020	Support Lean Thinking in the Global Standardization of Information Systems Management	Implement Global Standard Hardware And Software	Implement Unmodified Software Packages	Modify Open Issue Approvals only	Change Management Process	Information Team	
021	Support Lean Thinking in the Global Standardization of Information Systems Management	Implement Global Standard Hardware and Software	Leverage Vendor Supplied Software Upgrades	Maintain Simulation Database to Apply upgrades and 3rd Party	Change Management Process	Information Team	
022	Support Lean Thinking in the Global Standardization of Information Systems Management	Implement Global Information Technology Processes and Organization	Implement Secure Data & Operations Processes in a System that is Seamless to the Users	Utilize a Systems Management Tool for all Operations Changes	Change Management Process	Information Team	
023	Support Lean Thinking in the Global Standardization of Information Systems Management	Implement Global Information Technology Processes and Organization	Implement Standards for Systems Uptime & Reliability & Measure & Report Performance	Identify all data and Systems Operations Processes for Measurement	Systems Operations Processes	Information Team	
024							

Figure 11.17c (Continued)

to spirited defense of the process status quo. Power politics can sometimes play a negative role as well.

Often in technical innovation projects, the tendency to jump to the solution is paramount because of the fascination with the possibilities of the technology itself. The Lean Performance Analysis approach is that all lean improvements to a process must provide added customer value, or they aren't lean improvements, and the activity has been a waste of time and money. Adding MUDA to a process is not an improvement because there is no customer value in waste.

Lean Performance Analysis uses the lean principles, lean diagnostic tools, and Lean Performance practices to identify process problems and opportunities. We begin by defining the specific elements of the problems and opportunities, during the completion of the process workflow. During this task, we make observations and gather data and owner/customer input. This provides the basis for an analysis of data to determine the root causes of process problems. The general guidelines of Lean Performance Analysis are:

- Lean cultural principles govern. Challenge power players and those who work to subvert the open process of discussion and solution.
- Observe the workplace. Only here will you be able to make the observations, collect the data, and elicit the process expert and customer insights that provide the basis for Lean Performance.
- Focus as soon as possible on a specific process problem or opportunity.
- Use the Lean Performance Analysis steps systematically.
- Make a thorough diagnosis of the process.
- Always work in teams. No "lone rangers," especially those with personal agendas masquerading as processes or solutions.
- Produce a process workflow standard for documentation. Process documentation provides the vehicle for further understanding, suggestions, and improvements.
- Do not jump ahead to a favorite solution. Get complete data on the process "whats" first.
- Distinguish between process analysis and solution. Use any relevant lean diagnostic tool as a basically open-ended checklist to focus and trigger observation, analysis, and improvement, including:
  - SDCA/PDCA
  - 3 MUs
  - 5 Ss
  - 5 Ws-1H
  - 4 Ms

Lean Performance analysis utilizes an SDCA cycle in which the process is:

- Standardized (identified and mapped)
- Done (measured and improved)
- Checked (tested)
- Acted upon (implemented)

In the Lean Performance Analysis SDCA cycle, a process is *standardized (identified and mapped*) when process tasks are designed or identified with process experts/customers at the *what* level. Value-added tasks are confirmed. Current necessary tasks are challenged.

A process is *done (measured and improved)* when measurements are identified at process checkpoints. Tasks are mapped to process enablers, including new technologies, by the process expert. Process is improved to leverage new technology. Unmodified software is applied and a process workflow or other standard is produced.

The process is *checked (tested)* when process outputs are produced to the new standard in test mode and GAPs are identified and solved. Measurements are then confirmed at process checkpoints.

The process is *acted upon (implemented)* when process owner acceptance is confirmed. The process customer accepts output. Process control and checkpoints are accepted. Process work instructions are completed.

After the project is completed, a *PDCA* cycle will be employed continuously to continuously improve enterprise Lean Performance. In Continuous Lean Performance, lean enterprise environments that maintain process standards can plan process improvements through the Lean Performance Analysis cycle. In the PDCA cycle, proposed changes are documented on the Process Standard. Process changes are done in test mode. Results are checked. New process designs are acted upon (i.e., they are implemented).

The Lean Performance analysis SDCA/PDCA cycle develops process standards to ensure that *your* best practice is being followed. Following process standards creates processes delivering high quality. Errors are prevented. Communication is possible.

The successful use of the various lean diagnostic tools checklists usually precedes any attempt at a Lean Performance project in the information/support and management decision processes. Adapt the checklists already in use in your company, or the checklists presented earlier in this book, to the information/support and management decision process areas. Imagine using the 5 Ss checklist in the computer room or wherever the IT staff stashes all of the obsolete terminals, keyboards, routers, etc! Great results can follow if the tools are used with uniformity and humor.

Finally, Lean Performance Analysis improves processes. An improved process necessarily changes how work moves through the process. An improved process changes organizational responsibility assignments in that it changes how work is done. Inevitably, when the process work is complete, the organizational structuring work will need to be performed. That will be a focus in the third phase of the project: Continuous Lean Performance.

In order to complete Lean Performance Analysis, we first have to complete the process workflow. Begin by verifying that all information/support processes have been identified. Confirm process experts and customers. Confirm identification of

				PROCESS INTERVIEW AND STATUS LISTING											
	Level														
	1	Business Planning					Sales		Customer Service						
	2	Analyze Sales History	Analyze Open Orders	Analyze Seasonal Trends	Analyze Other Business Trends	Generate Forecast	Pricing	Analysis	Order Entry						
	3								Customer Profile Management	Establish Part Cross References	Receive Order				
	4										Receive EDI Order	Receive Mail Order	Receive FAX Order	Receive Telephone Order	Receive Internal Order
	ID NUMBER	1100	1200	1300	1400	1500	2100	2200	3110	3120	3131	3132	3133	3134	3135
	PRIORITY														
	C/S														
	STATUS	A	O	O	O	O	O	O	O	O	O	O	O	O	O
	OPEN		1	1	1	1	1	1	1	1	1	1	1	1	1
	ACTIVE	1													
	CLOSED														
	TOTAL	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RESOURCE															
List All	Process														
Owners and	Customers										1	1	1	1	1
									1	1	1	1	1	1	1
										1					
										1					
		1	1	1	1	1	1	1		1		1			
										1					
									1		1	1	1	1	1
		1	1	1	1	1	1	1	3	5	3	3	3	3	3

Figure 11.18 Process Requirements Definition—Interview and Status Listing

ORDER ENTRY
(1.3.1)

CUSTOMER PROFILE MANAGEMENT (1.3.1.1)	CUSTOMER ORDER CHANGE MANAGEMENT (1.3.1.2)	RECEIVE ORDER (1.3.1.3)	VERIFY PRICING (1.3.1.4)	VERIFY TERMS (1.3.1.5)	DETERMINE DELIVERY DATE (1.3.1.6)	MAINTAIN CREDIT DATE (1.3.1.7)	ENTER ORDER (1.3.1.8)	NOTIFY PRODUCTION (1.3.1.9)
RECORD TRANSIT TIMES		RECEIVE EDI ORDER			DETERMINE AVAILABILITY			
RECORD SHIP VIA		RECEIVE MAIL ORDER			ALLOCATE AVAILABLE INVENTORY			
RECORD SHIP DAYS		RECEIVE FAX ORDER			DETERMINE PRODUCTION LEAD TIME			
RECORD PART CROSS REFS		RECEIVE TELEPHONE ORDER			VERIFY CREDIT			
RECORD CUSTOMER CONTACTS		RECEIVE INTERNAL ORDER						

Figure 11.19 Process Requirements Definition—Order Entry

process with the process experts and customers. Develop a process purpose statement that each party can agree is correct.

The process workflow is developed *by the process experts and customers who perform and use the outputs of the process.* Do *not* use documents and drawings or any secondhand sources to develop the diagram. The project facilitator should create a spreadsheet or other management tool to schedule process requirements definition meetings between process experts and customers.

Follow *one* unit of work—an item, lot, order, or batch through the entire process as it is performed today. Define and map the steps or tasks in the process at a detailed input/output level to identify process requirements. Document *every* step in the process including disruptions in the flow. Identify what *really* happens, not what is *supposed* to happen. Illustrate the *what* portion of the process—*what tasks* must be done to produce the desired output. It is essential to begin to ask ourselves *why* we perform each task during the requirements definition activity so we retain only the value-added tasks in the process, producing outputs that our customers value. Figure 11.19 shows an example of a process at the requirements definition, or task level, only.

Process experts then prepare a draft process workflow of their processes with task section (process requirements) only completed.

Project Result: "Before" Process Diagram

Now each process expert uses each lean principle to examine the "before" process workflow diagram. They look for any deviation from lean principles. They are specific. They find all nonvalue-added tasks and interruptions.

We said earlier that the Lean Performance project would be governed by and would apply the lean cultural and transformational principles to the information/support and management decision processes. The Lean Performance Analysis is brought into sharper focus by applying the lean transformational principles to the emerging process workflow. They are:

- Precisely specify value by product or family
- Identify the value stream for each product
- Make value flow without interruption
- Let customer pull value from process owner
- Pursue perfection

Our discussion begins with the first lean transformational principle: "precisely specify value by product or family." We start with a definition: value is that product or service that the process customer would specify as being what he or she needs as the output from a given process. It is measured by what he or she is willing to pay. It can be discovered by taking the role of the customer and asking if I were the customer of this process, would I be willing to pay for it?

To precisely specify value by product or family is broader than what we attempt here. It is more to our purpose to target this activity as "precisely specify value by process and/or within process." To do so, the process experts and customers ask and answer the following questions about their processes:

- Can you clearly identify the process?
- Is there an up-to-date process standard (BOM, routing, procedure, work instruction) with *all* process tasks/steps identified?
- Could anyone in the company perform the process, after some training, based on the process standards?

Now we turn to the second lean transformational principle, "identify the value stream for each product." We are going to need to start with slight modification to this lean transformational principle, in that we are dealing with processes, and many of those processes may deal with one or more products in the typical company. It would be more to our purpose to "identify the process value stream and tasks within each process."

Value-added tasks can be identified within the process value stream by taking the role of the customer and asking, "If I were the customer of this process, would I be willing to pay for this task?"

The process experts and customers should look for value-added tasks to retain in their process. Here are some examples of value-added and nonvalue-added tasks:

- Value-added
  - Ordering
  - Fabricating
  - Assembling
  - Packing
  - Shipping
  - Filing a Claim
  - Waiting
  - Counting
  - Inspecting
  - Checking
  - Copying
  - Filing
- Nonvalue-added
  - Expediting
  - "Temporary" processes
  - Workarounds
  - Supplemental processes
  - Extra systems
  - Formal vs. informal systems

(Adair and Murray, *Breakthrough Process Design*, 119, 1994)

Next, the teams should investigate to determine if they have identified any additional tasks performed in the process that are not yet included on the process workflow standard and ask if those tasks provide customer value (i.e., would the customer pay for them if he or she knew we were doing them?).

Analyze each task on the process workflow diagram for value-added process time, using measurements such as dates and time stamps. Usually, value-added time will be in minutes, and nonvalue-added time will be in hours or days.

Complete an improved process workflow diagram that does not include the nonvalue-added steps/tasks. Unfortunately, there are process tasks that are necessary for legal, regulatory, or business reasons, tasks like audit or invoicing. Before deciding to eliminate a nonvalue-added task, teams should ask if the task is required by regulation or law or is otherwise necessary for business survival. Determine where nonvalue-added steps must remain for now, because they are required by "management" or are a cost trade-off or space trade-off.

Now we turn to the third lean transformational principle, "make value flow without interruption." Flow is the uninterrupted movement of a product through the steps in a process and between processes.

A definition of process flow would also be useful, because in the information/support process improvement arena, we are dealing with a type of flow. "Flow is what changes the process from a static entity consisting of the work progressing through the inputs, tasks, and outputs into a dynamic concept.…Flow varies from hour to hour and day to day. Flow is affected by volume, mix, new customer requirements, changes in people, environment and a host of other factors" (Adair and Murray, *Breakthrough Process Design*, 111–112, 1994).

Because we're going to be working with process flow, it might be useful to know what the characteristics of flow actually are, and how to identify and measure those characteristics. To measure key flow characteristics, we should start by documenting the time required and distance traveled for each unit of work. Use measurements like dates, time stamps, feet, or yards. Ask if the process has any built-in interruptions or delays or any side journeys for the work in process. WIP includes paper, by the way. We can also chart the flow by measuring the distance that the unit of work moves. This process, much like the development of the MIFA diagram, will illustrate "disconnected" flow in the process, if it exists. Longer distances result in longer move times, and longer move times result in bigger batches. Bigger batches result in longer waits. Longer waits result in more WIP. More WIP requires more space. More space results in longer distances, and on and on.

Measuring and documenting time and distance characteristics of process flow also illustrates other process characteristics, for instance that of process interruptions. Process interruptions occur when tasks produce outputs at different rates. When tasks are mismatched, movement of work occurs in batches instead of flowing in small units or in the optimal small unit (one). Movement of process work units in batches always produces higher WIP. Again, think of the paper present in an information/support process as the WIP. All interruptions to flow produce waiting time and longer process cycles. Just as in physical product processes, task input rate variation means task output rate variation, setup and changeover time expansion, quality problems, and process breakdowns. Characteristics of intermittent flow include batches of more than one, task activity separation, unnecessary movement, and queues of work waiting for processing. The characteristics of continuous flow are that work is consistent and regular, balanced with stable capacity utilization (no one is over- or underloaded). When work and workflow, including information work, is balanced, processes are synchronized with customer needs. How often can we think of an instance where a downstream process is waiting for work, but the upstream process is running a "batch" report? The generation of customer requirements to feed a shop schedule is perhaps the best example to use for illustration. Timing the release of customer order–based "schedules" derived through the grouping of orders into processing batches defeats the very mechanics of pull and flow on the manufacturing floor that we have worked so diligently to obtain. The Lean Commerce model shown in Figure 11.11 provides for the delivery of each customer requirement as they are received as rapidly as possible to the end fabrication area of shipping or assembly. The quicker the folks making products get the order, the quicker the order can be filled. A batch size of one is optimal for physical processes, and a batch size of one is the goal of information/support processes in the lean enterprise. The results of balanced flow are lower WIP (less paper) and quickest throughput to downstream customers, especially with the advent of workflow messaging technology, the capability to achieve balanced flow and reduce batch quantity to one, and the increase of move frequency to one-at-a-time creates the opportunity to link tasks from the information/support processes to the physical product processes and enhance the capability of an already Lean Production environment to produce at the same (output) rate of the customer pull, and achieve TAKT time implementation throughout the physical and supporting information processes.

Turning to the fourth lean transformational principle, "let customer pull value from the process owner," let's begin with a definition of pull: pull is the signal to initiate a process that comes from downstream processes and ultimately the customer. To discover the answer, ask and answer these questions of the teams:

- Is the process directly connected to the customer?
- Does the process expert deal directly with the end customer? If so, does the process expert review the process with the customer regularly to ensure customer satisfaction?
- Is the process customer internal? If so, does the process expert review the process with the customer regularly to ensure customer satisfaction?

The final lean transformational principle, "pursuit of perfection," is the maintenance and continuous improvement of the four preceding lean transformational principles. In the Lean Performance Analysis, this is the PDCA cycle based in using Process Standards as the input to improvement activities.

To pursue process perfection, ask if there is a regular review of the performance metrics (QCD) of the process? In the Lean Performance Analysis, we will suggest a process measurement for each process analyzed in the policy deployment Lean Performance Analysis stream.

Process experts also make it OK for the customer to suggest improvements to the process. They identify any recent improvements to the processes and ask whether or not these met the goals of the lean transformational principles. They analyze and challenge "root causes" of all remaining process tasks, especially challenging nonvalue-added but "necessary" tasks. Team members utilize their knowledge of the traditional lean diagnostic tools to pursue perfection in their process by utilizing the lean diagnostic tools checklists:

- 3 MUs
- 5 Ss
- 4 Ms
- 5 Ws-1 H

Next, the process owners complete the process workflow standard to demonstrate *how* the software will perform the process. This is the most appropriate time for the teams to attend software education. Armed with their process workflow drafts specifying the process requirements, the process owners can enlist the assistance of the software vendors' trainers and consultants in answering the *how* questions.

To apply the manufacturing software package, first obtain complete documentation from the vendor for each application. Next, evaluate standard software screens and reports for completeness and ease of use. Then, map and evaluate the standard software to the process requirements, highlighting any task that is not enabled properly by the software. Investigate the possibility of workaround solutions for any missing software features and capability. We'll revisit these issues during the GAP analysis that follows next.

Although most software packages for ERP and other manufacturing applications from solid vendors are packed with more process-enabling features than any implementation can reasonably use, occasionally the application of the software causes some additional tasks to enter the process. Some of these software-required tasks may even appear to be MUDA. When we apply the new software, it is paramount to remember that a value-added improvement is a change to a process task that increases value by reducing cost, improving quality, or speeding delivery. We need to question any task added to our process by the enabler that does not add value. We may have to live with some of them. The Lean Performance Analysis contains a vehicle for questioning process or system GAPs, coming below.

While documenting their processes, owners should be sure to obtain examples of key forms, documents, computer reports, and screens involved. These should be used to verify that the new system will accomplish the full range of process requirements and will be useful later in completing the process work instructions. Revise the draft process workflow diagrams to include all necessary system supports at an input-output level. Identify input and output problems and symptoms, if any.

Building an effective process workflow requires a complete process requirements definition. There should also be an iterative trial-and-error team activity while software package capability is investigated and applied. Willingness to ask *why* a task is performed, and *what* value is provided to the customer, is essential. A process workflow standard is complete when necessary and value-added tasks (the *what*) are defined and agreed upon, and the software package or other enabler is applied to demonstrate *how* the process will be done. The *who*, *when*, and *where* decisions are then agreed upon, confirming process owners, customers, and process boundaries. Figure 11.20 provides an example.

While process workflows are being completed, the project manager should collect the Lean Performance Analysis masters with process and team identified and distribute results to the team. The project manager should then report the results to date of the Lean Performance Analysis to the steering committee to keep it abreast between meetings.

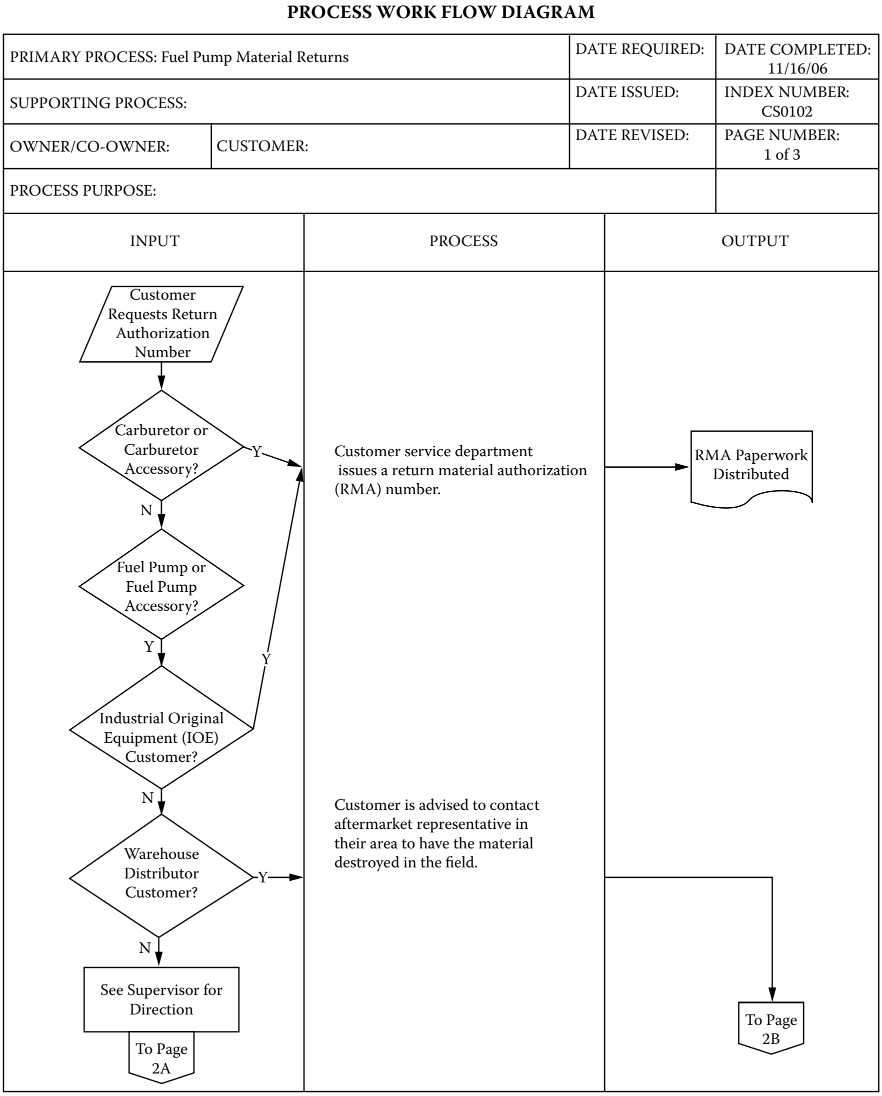

Figure 11.20a Fuel Pump Returns Process Workflow Standard

With process workflow standard in hand, now the process owners and customers are ready for lean process improvement, employing a question-and-investigate discourse resulting in (potential) plans to improve processes.

Analyzing a process workflow standard is the single most effective technique for identifying opportunities for process improvement. Before we get real complicated, remember that examining the boundary tasks of two consecutive processes can result in the harvesting of "low hanging fruit" (i.e., the obvious improvements).

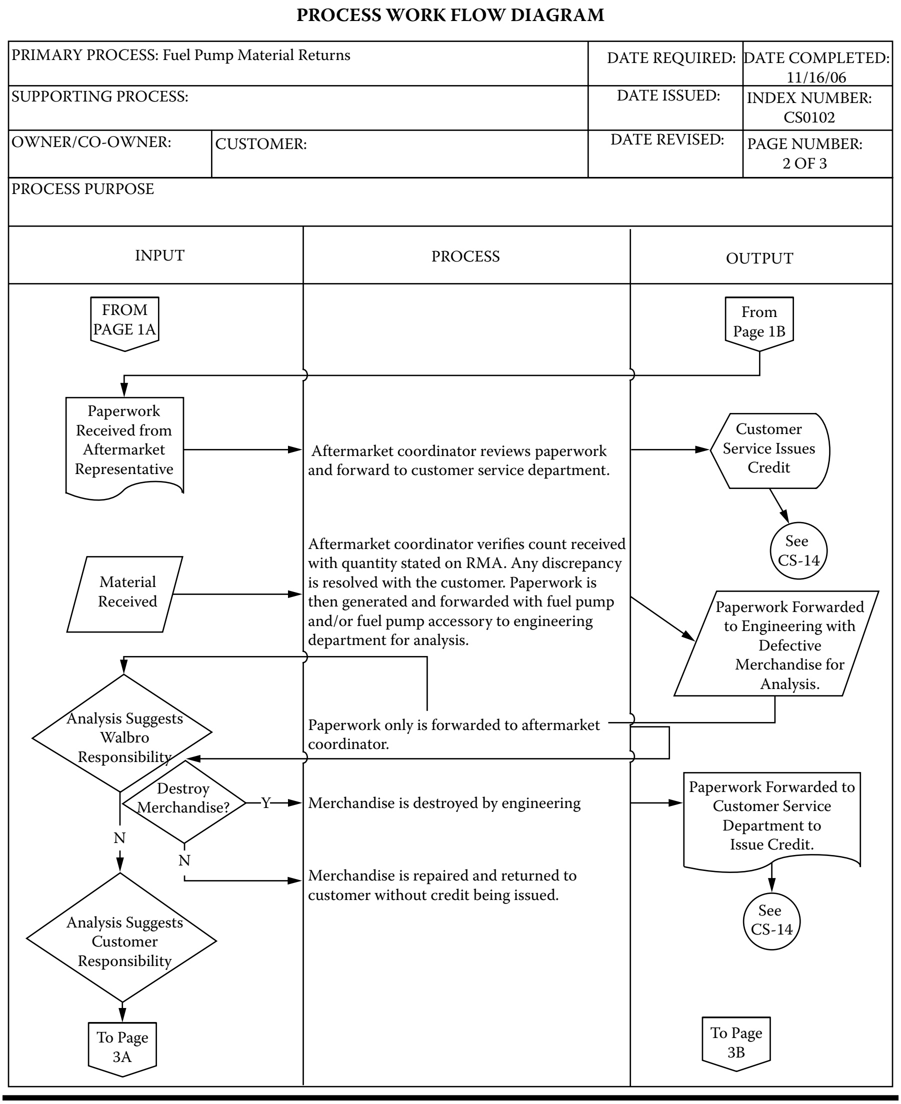

Figure 11.20b (Continued)

Often, these improvements can be made by eliminating travel time and distance, eliminating duplicate counting and checking, and eliminating the inspection of work being handed off from one "silo" to another.

As the process workflow standards near completion, process experts and customers should meet in cross-functional and cross-enterprise team meetings to challenge and improve their processes by evaluating and measuring process performance

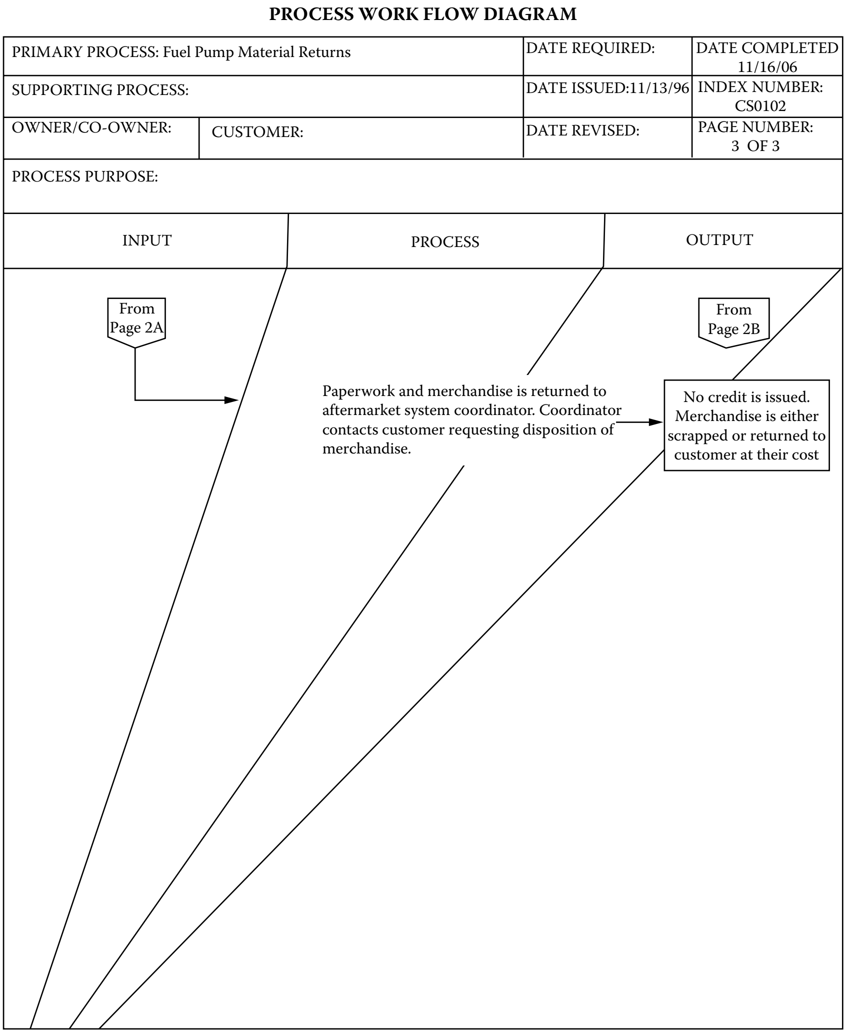

Figure 11.20c (Continued)

characteristics and measurements. Team members should meet with the project facilitator to examine their processes and ask critical Lean Performance questions, including those on the Challenging Processes Checklist:

Challenging Processes Checklist

Process Integration/Total System Focus

Are there any opportunities or requirements presented by new software, machine, tool, or other process-enabling capabilities?

____
____
____

Process Waste and Strain

Does the process utilize more resources than necessary, or does it require additional or redundant tasks?

____
____
____

Are there any process tasks that strain the operating resources of the system?

____
____
____

Are there any process tasks that cause waiting time or queues?

____
____
____

Process Discrepancy

Who owns the process? Is there a co-owner?

____
____
____

What is the process output?

____
____
____

Where is the process performed?

____
____
____

When is the process performed?

____
____
____

How often is the process performed?

____
____
____

Why is the process performed?

____
____
____

Do the process owners and customers agree about process tasks and the need to perform them?

____
____
____

Is the process based in a common data source?

____
____
____

Process Empowerment

Have we eliminated process barriers and redundant counting and checking and verifying tasks?

____
____
____

Are there any interdepartmental transfers and interfaces?

Are there handoffs and duplicate efforts involved in transferring paper, documents, data, or other process elements between or within departments or other dividers?

Are process owners closely linked to their process customers? Any layers to remove?

Are there any barriers remaining between the customer input and the decision makers, task doers, and process owners?

Can the process be improved by local decision making or other empowerment?

Are all employees involved in the process empowered to fulfill their tasks?

Process Effectiveness

Does the process fulfill its purpose?

Does the process reduce business risk?

____
____
____

Does the process increase control over:
Cost elements or causes?

____
____
____

Quality of output?

____
____
____

Speed of output?

____
____
____

Process Efficiency and Timeliness

Is the process efficient?

____
____
____

Are there any bottlenecks in the process? How can they be eliminated?

____
____
____

Process Cost

Is there a measurable cost for the process?

____
____
____

Are the measurements at a task (manageable) level?

____

____

____

What are the cost drivers?

____

____

____

If measurable cost is not possible, can a cost be estimated?

____

____

____

Have we applied a vendor-supplied and -maintained software or other process enabler wherever possible?

____

____

____

Have we minimized or eliminated the use of custom software or other costly process enablers wherever possible?

____

____

____

Process Quality

Are there any process tasks that are based on or produce data or information not commonly accepted to be accurate? What is the root cause?

____

____

____

How is process quality ensured?

____

____

____

What is the measured quality of the process?

____
____
____

How often do we have to reprocess the work performed in this process because of an inaccurate result?

____
____
____

Process Speed

Is process speed or throughput time being measured? Are these measurements at a task level?

____
____
____

Are there waiting periods, transfer time, or other queues, including batch processes, in this process? Can they be eliminated?

____
____
____

Process Complexity

Can the process be simplified?

____
____
____

Are there any interdepartmental transfers or interfaces? Can they be reduced or eliminated?

____
____
____

Is the process supported on a single CPU or server? If not, why not?

____
____
____

Is all process data provided by a common central source (database)?

____

____

____

Is there any dependency on a PC database?

____

____

____

A completed process workflow standard is now ready for wider analysis. The teams meet to critique the processes using a practice called the GAP analysis. We are especially interested in those processes that have a system enhancement recommended or that contain a critical realization of project objectives. GAPs, also known as problems or opportunities, are found at two levels in an organization. At the strategy and organization levels, products, services, and markets are the focus. In a Lean Performance project, processes and the GAPs found in them are the focus. If this were a reengineering project, we would tackle the organization-strategic GAPs and attempt to redesign/redefine products, services, mission, and markets. Of course, that would make this a "mission impossible." Lean Performance Analysis identifies process and system GAPs at the Activity process level, so teams should refer any findings at the organization strategy level to the steering committee for new lean strategy development and management policy deployment during phase 3.

The Lean Performance project started with lean business policies and deployed them to the Activity or process level. Process tasks, inputs, and outputs have been our concentration. Process and system GAPs are the identifiable impediments to better process performance. A process GAP is the difference between what the process provides and the process customer's minimum acceptable standard. A system GAP is the difference between what the enabling IT system provides and the process owner's minimum acceptable standard. Process and system GAPs state system functionality sought or needed by process owners and customers to achieve project objectives derived from the lean business policies and lean project strategies.

Solutions to process GAPs are proposed by process experts and customers where GAPs in process or system block attainment of project objectives. In any case, a cost/benefit estimate must be completed. Site teams are empowered to act within the project scope to meet project objectives. In the Lean Performance Analysis, Lean Performance teams identify potential system GAPs as the manufacturing software is mapped to the process tasks. The GAPs are provided to the information systems team members, utilizing the open issue format for preliminary analysis. Lean Performance teams also evaluate the workaround solutions for missing software features and capabilities highlighted by the process owners during the development of the process workflow standards. The teams develop solutions that support the full realization of lean project objectives at the process level. They select, prioritize, and submit solutions for system integration development to the steering committee through the open issue process.

The information team has a number of important responsibilities to perform during the GAP analysis. Chief among them is to evaluate the effectiveness of the current use of PCs and to identify process tasks that occur on PCs that are candidates for central database and CPU support. The information team should evaluate processor utilization and effectiveness where more than one CPU is used in a process. It should highlight process tasks that require support from multiple processors or servers, considering multimachine file support wherever necessary.

The team should suggest process improvements so that each process can occur on a single CPU when possible. The information team should also analyze the process workflows for location handoffs and system data implications. It should confirm the effective application of standard vendor unmodified software, especially where use of standard software capability can possibly solve GAPs identified by process owners. It should consider requirements and opportunities for process integration presented by new software.

On another front, the information team should ensure that every process workflow is seamless to the users and suggest revisions where necessary. It should ensure optimum data process sequencing and ensure that all new data elements are available for processing on the appropriate screens. Prior to recommending any modifications to support GAP solutions proposed, the information team should determine where GAPs are only interim or phased requirements resulting from current system interfaces and limitations already in the process of being corrected.

The information team should also examine each process workflow using its knowledge of the enabling software and verify that the teams have taken full advantage of the opportunities presented. The information team should verify that full benefit has been attained from the data processes to automate the information/support processes, or any tasks in the information/support processes, as well as to integrate or link information/support processes or individual tasks within information/support processes. The information team should resequence process tasks where possible in order to reduce MUDA. This may involve linking more than one location together to share or process information or data, as in a cross-functional or cross-enterprise process. The information team should verify that all opportunities to inform, distribute, and share information, or to keep track of activities and report on them, are within the information/support processes or outside of them but linked by task or other user dependency. Often, the information team members can see an unrealized opportunity to provide data for analysis, or to perform analysis and provide data to another process.

Next, the facilitator should conduct Lean Performance team cross-functional and cross-enterprise Lean Performance Analysis GAP sessions with all teams, analyzing the GAPs selected at the process level by the respective teams. By beginning with the improved Organizational or Activity processes, the cross-functional and

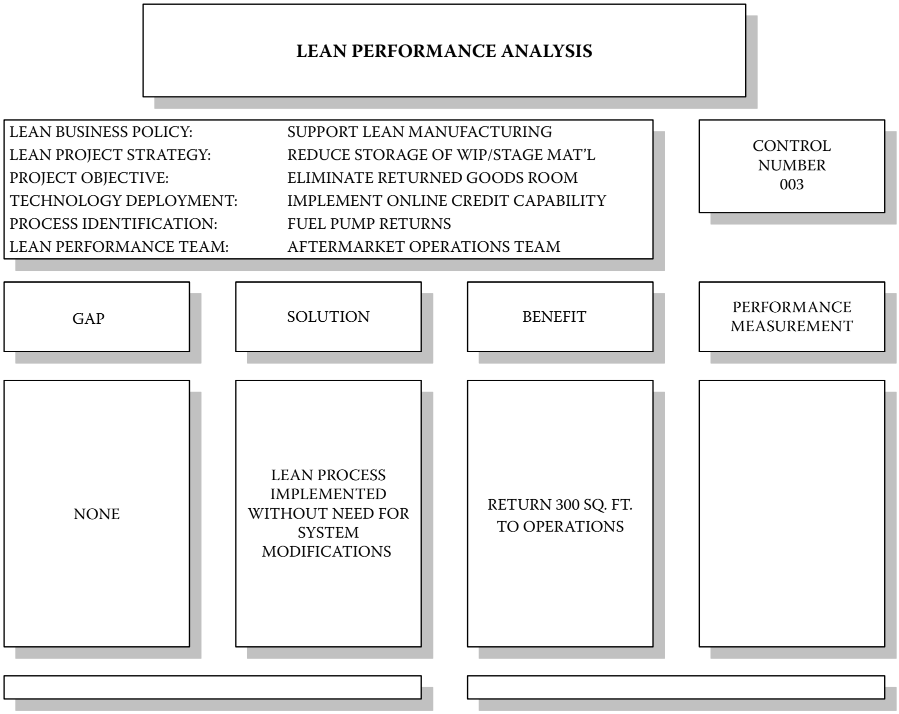

Figure 11.21 Lean Performance Analysis—GAP Solution and Benefit

cross-enterprise teams can eliminate a good deal of complexity, and build from a solid foundation of already improved processes. The assigned and any other identified cross-functional processes can be analyzed sequentially by reviewing the discrete components and then be presented concurrently to illustrate the full breadth of the process. Cross-functional processes depend more on complex organizational (departmental) interaction, due to conflicting priorities and schedules. Lean improvement of cross-functional processes may involve organizational restructuring to develop clear ownership, responsibility, and authority for a given process.

The analysis of cross-enterprise processes resembles cross-functional process analysis, only with more complexity. Processes can still be analyzed sequentially and then presented concurrently. The analysis also depends on complex organizational interaction across company boundaries. These lean improvements also involve organizational restructuring within and across companies. In order to accomplish this, it is necessary to develop a process level case demonstrating the benefit of utilizing the improved process and implementing the GAP solution.

The final element of the Lean Performance Analysis is defining process performance measurements. Processes are amenable to a variety of measurements, including time to execute or cycle, cost per cycle, and the variability, usefulness, and consistency of the process output. It is also possible to measure to the negative, concentrating on the occurrence of process input and output defects. During the Lean Performance Analysis, team members begin to define process performance measurements. These measurements will be formalized and implemented during the third phase of the project: Continuous Lean Performance. For now, it is enough to identify possible measurements and begin to monitor them for usefulness, prior to proposing them to the steering committee.

At the conclusion of the GAP analysis, the teams determine candidates for modification, where a modification will demonstrate benefit. Each process owner illustrates GAPs in its own processes and recommends system enhancements to support the improved process. See Figure 11.21 for an example.

The project manager should also stop for a minute to evaluate current project performance to established project objectives. Examine the early winners, that is, the new processes developed, processes improved, and processes made obsolete. What improvements were gained? Where can these same lessons be applied? Review Lean Performance Planning diagrams for adequacy. Update and improve them where necessary. The teams should complete updating of the improved processes with process workflow standards for handoff to the development of work instructions.

Producing Work Instructions

The next task is for the teams to develop process work instructions for the completed process workflows, utilizing the approved project format. This is also the point in the project to revise forms and other documentation as required. Be sure to review preliminary drafts with supervisory and lead personnel and revise as necessary and obtain approval. Then, verify forms to processes for quantities and completeness and order beginning quantities of forms where needed. Draft in ISO 9000 or QS or other applicable format, the work instructions identifying document and transaction flows and responsibilities. See Figure 11.22 for an example.

Review the process workflows and determine where any manual procedures will be needed for implementation, especially for the workarounds. Include support for interim and phased implementation. Be sure to include reference to all process work instructions in the process master index. See Figure 11.23 for an example.

Include all project diagrams completed thus far in a project quality assurance review. Be sure to update any diagrams where project changes have occurred. Include the following examples:

- Process workflow standards
- Process work instructions
- MIFA diagrams
- BOMs and routings

WORK INSTRUCTION

SCREEN NAME: On Line Return Credit		REV. LEVEL 0	SITE CODE: 001	INDEX NUMBER: 0713
	PAGE: 1 OF 1	DATE ISSUED:	DATE REVISED:	DATE PRINTED: 5/3/2007

COPY 1ST SCREEN REFERRED TO IN INSTRUCTION

ORDER: SYSTEM ASSIGNED, (CAN ASSIGN MANUALLY)
PRESS THE ENTER KEY FOR THE NEXT FIELD

SOLD-TO: ENTER THE CUSTOMER CODE
PRESS THE ENTER KEY FOR THE NEXT FIELD

BILL TO: CODE DEFAULTS TO SOLD-TO CODE, UNLESS OVERRIDDEN
PRESS THE ENTER KEY FOR THE NEXT FIELD

SHIP-TO: DEFAULTS TO THE SOLD-TO CODE
PRESS THE ENTER KEY FOR THE NEXT FIELD

ORDER DATE: THE DATE THIS ORDER WAS ENTERED
PRESS THE ENTER KEY FOR THE NEXT FIELD

REQUIRED DATE: DEFAULTS TO DUE DATE
PRESS THE ENTER KEY FOR THE NEXT FIELD

PROMISE DATE: DEFAULTS TO DUE DATE
PRESS THE ENTER KEY FOR THE NEXT FIELD

DUE DATE: CUSTOMER REQUIRED DATE MINUS SHIPPING LEAD TIME
(PLANNING USES THIS DATE)
PRESS THE ENTER KEY FOR THE NEXT FIELD

PURCHASE ORDER: ENTER THE CUSTOMER
POPRESS THE ENTER KEY FOR THE NEXT FIELD

REMARKS: CAN ENTER GENERAL REMARKS ABOUT THIS CUSTOMER
PRESS THE ENTER KEY FOR THE NEXT FIELD

PRICE TBL: IF SETUP A PRICE WILL DISPLAY
PRESS THE ENTER KEY FOR THE NEXT FIELD

DISC TBL: IDENTIFIES A PRICING STRUCTURE (BASED ON SHIP-TO ADDRESS)
PRESS THE ENTER KEY FOR THE NEXT FIELD

Figure 11.22 Online Return Credit Work Instruction

PROCESS MASTER INDEX

PROCESS WORKFLOW LISTING	DATE ISSUED	INDEX NUMBER
MASTER INDEX	DATE REVISED 12/5/2006	

DOCUMENT CROSS REFERENCE	
DOCUMENT RETRIEVAL INSTRUCTIONS	
MANAGEMENT SUMMARY	
BUSINESS PLANNING	**INDEX #**
BUSINESS PLANNING	BP-01
LABOR REQUIREMENTS	BP-01.01
MATERIAL REQUIREMENTS	BP-01.02
PURCHASE PLAN	BP-01.02.01
CUSTOMER SERVICE	
QUALITY REPORTING-CUSTOMER RETURNS	CS-01
INVOICING	CS-02.01
CUM. SHIPPED RECONCILIATION	CS-02.02
PRICING	CS-03
SALES FORECASTING	CS-04.01
QUOTING	CS-04.02
ORDER PROCESSING	CS-05.01
PURCHASE ORDER MAINTENANCE	CS-05.02
AFTER MARKET ORDER PROCESS	CS-05.03
PRODUCTION & OPERATIONS MANAGEMENT	
PRODUCTION LINE SCHEDULING	PO-01
PRODUCTION LINE SCHEDULING-PILOT RUNS	PO-01.01
WIP - MACHINING CASTINGS	PO-02.01
WIP-MACHINING COVERS	PO-02.02
MACHINING DEPT. MATERIAL FLOW-CASTINGS/COVERS	PO-02.02.01
WIP - PRE - ASSEMBLY	PO-03.01
WIP - FINAL 1 ASSEMBLY	PO-03.02
WIP - FINAL 2 ASSEMBLY	PO-03.03
MATERIAL FLOW MAP FOR PRE-ASSEMBLY, FINAL1, FINAL2 - WMX	PO-03.03.01

Figure 11.23a Process Master Index

Conduct a Quality Assurance Review (QAR) review with the outside reviewer to validate the project results to date. Be sure to present the updated diagrams and other documents to report to the Lean Performance teams for approval before presenting them to the steering committee. Obtain approval to proceed with the implementation of improved processes from the steering committee. Then, begin the Integrate Systems Module.

PROCESS MASTER INDEX

PROCESS WORKFLOW LISTING	DATE ISSUED	INDEX NUMBER
MASTER INDEX	DATE REVISED 12/5/2006	

PRODUCTION & OPERATIONS MANAGEMENT (con't.)	**INDEX #**
MANUFACTURING - WED	PO-04.01
MANUFACTURING FLOW FOR MA SERIES	PO-04.01.01
MANUFACTURING FLOW FOR MB SERIES	PO-04.01.02
DIECASTING - TPP	PO-05.01
DIECASTING MATERIAL FLOW - TPP	PO-05.01.01
SHOP FLOOR REPORTING - PROD. REPORTING	PO-06.01
SHOP FLOOR REPORTING - LABOR REPORTING	PO-06.02
WORK ORDER RELEASES	PO-07.01
WORK ORDER RELEASES - COMPONENT REQUISITIONING	PO-07.02
PLANT MAINTENANCE - PREVENTIVE MAINT.	PO-08.01
QUALITY REPORTING & ANALYSIS - DEFICIENCY REPORTING	PO-09.01
QUALITY REPORTING & ANALYSIS - SORT/REWORK/SCRAP/RTV	PO-09.02
QUALITY REPORTING & ANALYSIS - COMPONENT SAMPLING	PO-09.03
QUALITY REPORTING & ANALYSIS - SMALL PARTS INSPECTION	PO-09.04
QUALITY REPORTING & ANALYSIS - MACHINE LINE INSPECTION	PO-09.05
QUALITY REPORTING & ANALYSIS - PRE-ASSY. INSPECTION	PO-09.06
QUALITY REPORTING & ANALYSIS - FINAL 1 INSPECTION	PO-09.07
QUALITY REPORTING & ANALYSIS - FINAL 2 INSPECTION	PO-09.08
QUALITY REPORTING & ANALYSIS - FINAL TEARDOWN	PO-09.09
QUALITY REPORTING & ANALYSIS - FINAL VISUAL	PO-09.10
QUALITY REPORTING & ANALYSIS - SCRAP ACCOUNTING	PO-09.11
TOOL & GAUGE CONTROL	PO-10
SUPPLIER MANAGEMENT	
MRP REPORTS - MRP PLANNING - REVIEW	SM-01
CONTRACT MANAGEMENT - PURCHASE ORDER PROCESS - REQUISITIONING	SM-02.01
CONTRACT MANAGEMENT - PURCHASE ORDER PROCESS - PO GENERATION	SM-02.02
CONTRACT MANAGEMENT - PURCHASE ORDER PROCESS - SPOT BUYS	SM-02.03
CONTRACT MANAGEMENT - PURCHASE ORDER PROCESS - EXPEDITING (DOM.)	SM-02.04
CONTRACT MANAGEMENT - PURCHASE ORDER PROCESS - EXPEDITING (FOR.)	SM-02.05
CONTRACT MANAGEMENT - PURCHASE ORDER PROCESS - RESCHEDULES	SM-02.06
CONTRACT MANAGEMENT - PURCHASE ORDER PROCESS - TOOLING ORDERS	SM-02.07
CONTRACT MANAGEMENT - PURCHASE ORDER PROCESS - MAILING PO	SM-02.08

Figure 11.23b (Continued)

PROCESS MASTER INDEX

PROCESS WORKFLOW LISTING	DATE ISSUED	INDEX NUMBER
MASTER INDEX	DATE REVISED 12/5/2006	

SUPPLIER MANAGEMENT (con't)	**INDEX#**
CONTRACT MANAGEMENT - PURCHASE ORDER PROCESS - MRO PO	SM-02.09
SUPPLIER EVALUATIONS - SOURCING/QUOTATIONS -SELECTION	SM-03.01
SUPPLIER EVALUATIONS - SOURCING/QUOTATIONS -APPROVED VENDOR LIST	SM-03.02
SUPPLIER EVALUATIONS - SOURCING/QUOTATIONS - SUPPLIER SET UP	SM-03.03
SUPPLIER EVALUATIONS - SOURCING/QUOTATIONS - RFQ	SM-03.04
SUPPLIER EVALUATIONS - SOURCING/QUOTATIONS - PERFORMANCE RATING	SM-03.05
INVENTORY MANAGEMENT & LOGISTICS	
MASTER SCHEDULING - DEMAND DETERMINATION	IL-01.01
MASTER SCHEDULING - PRODUCTION MIX/QTY.	IL-01.02
RECEIVING - AZ WAREHOUSE	IL-02.01
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RECEIVING - STOCKROOM	IL-02.03
RECEIVING - INCOMING INSPECTION	IL-02.04
RECEIVING - MRO SUPPLIES	IL-02.05
RECEIVING - SAMPLE PARTS	IL-02.06
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INVENTORY CONTROL - PRODUCTION REPORT	IL-04.02
INVENTORY CONTROL - LOT CONTROL	IL-04.03
INVENTORY CONTROL - PARTS RECOVERY	IL-04.04
INVENTORY CONTROL - PEICE COUNT VERIFICATION	IL-04.05
INVENTORY CONTROL - BULK ISSUES	IL-04.06
INVENTORY CONTROL - PHYSICAL INVENTORY	IL-04.07
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WAREHOUSING - WAREHOUSING CONFIGURATION	IL-06

Figure 11.23c (Continued)

PROCESS MASTER INDEX

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CUSTOMS - MRO IMPORTATION	FM-01.02
CUSTOMS - EXPORTATION INVOICING	FM-01.03
NAFTA - CERTIFICATES OF ORIGIN	FM-02.01
NAFTA - ASSEMBLY DESCRIPTIONS	FM-02.02
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PRODUCT COSTING - STANDARD COSTS	FM-03.02
PRODUCT COSTING - CRN'S	FM-03.03
PRODUCT COSTING - QUALITY COST REPORTING	FM-03.04
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ACCOUNTS PAYABLE	FM-06
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GENERAL LEDGER - GOVERNMENT REPORTING	FM-07.03
GENERAL LEDGER - TAXES	FM-07.04
GENERAL LEDGER - MONTH END CLOSING	FM-07.05
INVENTORY ACCOUNTING - VALUATION	FM-08
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ECN - CHANGE NOTICF	PE-01.02
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BILL OF MATERIAL - PARTS LIST MAINTENANCE	PE-02
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R & D - NEW PRODUCT RELEASES	PE-03.02
PRODUCT MASTERS - WHERE FIRST USED LIST	PE-04.01
PRODUCT MASTERS - DATA MAINTENANCE	PE-04.02
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ENGINEERING DRAWING - DRAWING MAINTENANCE	PE-05.02

Figure 11.23d (Continued)

PROCESS MASTER INDEX

<table>
<tr><td>PROCESS WORKFLOW LISTING</td><td>DATE ISSUED</td><td>INDEX NUMBER</td></tr>
<tr><td>MASTER INDEX</td><td colspan="2">DATE REVISED
12/5/2006</td></tr>
</table>

PERFORMANCE MEASUREMENTS	**INDEX #**
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SHOP DELIVERY PERFORMANCE	PM-04
INVOICING ACCURACY	PM-05
PRODUCT QUALITY	PM-06

CONTROL FILE SET UPS
SALES QUOTE CONTROL FILE
SALES ORDER CONTROL FILE
CUSTOMER SCHEDULES CONTROL FILE

Figure 11.23e (Continued)

Chapter 12

Integrating Systems Module

Project Team Tasks

Installing Hardware and Software

The information team should begin to install system hardware and software, including printers. Although every system installation is different, there are some tasks usually found in the installation of hardware and software for every system. I provide a template here of what I believe to be the usual basic tasks, but my purpose is more to review in a general way the tasks that the hardware and software vendors probably have outlined in great detail in their installation manuals. The information team technical support people have already attended hardware and software technical support training and should be thoroughly familiar with the manuals and other instructions prior to beginning the install. This is not intended to supersede those manuals. It is rather intended as a guide for the project manager and as an aid in the construction of the overall project plan. I do not specify installation tasks for the system CPU.

After installing the system CPU, the next step is not always installing the application (ERP, MES, CRM, SCM, etc.) software. Often, database and utility software must be installed first. Then, we can install the application software. There should be tasks outlined to verify disk space, determine directory structures, and provide periodic review of the error reporting to look for hardware failures. The information team should also frequently review the system error reporting for operating system software errors, and review error reporting for application software errors. The information team should document the processes it will employ in each error situation that the system manuals, or the error reporting, indicates.

Project Result: System Recovery Log

Initiating the System

To initiate the system, the following tasks are typically included:

- Create user help fields
- Create start-up scripts
- Set up generalized codes
- Set up function keys
- Set up batch identifiers
- Set up general ledger entities
- Define system/account control file
- Set up language codes
- Set up default language codes for users
- Set up company addresses
- Set up taxes with only one tax system supported per database
- Set up currencies and exchange rates
- Finalize address coding methods
- Define address control file

Setting Up System Security

Next, set up system security. Again, most systems will include requirements such as:

- User IDs
- Passwords
- Menus

Prepare a user list and the functions they will use, based on the process ownership from the process master index. Run a system menu report and provide initial user menus for each system user. Request a process operator list for each process from the process owners and assign user IDs.

Creating Test and Training Environments

As soon as possible, create separate environments to utilize for testing purposes and for training and developing work instructions. Develop and load the test data files in the test and training environments with real data. If possible, utilize conversion programs for loading data. When the test and training environments are stabilized, retain a baseline copy for periodic refresh, in the test environment only. As for the training environment, the project trainer will have final say on when (if at all) to refresh the data. There should be no formal testing in the training environment, as the process owners and operators will provide plenty shortly during the process test. Ensure that the test and training environments stay current as program changes, upgrades, and system-setting decisions are released to the production environment.

Creating Production Databases

Create production databases only after all project testing and decisions have been accomplished, at the conclusion of the process tests. Be sure to provide system users with a listing or menu of the available databases, using the database connect or similar tool. Finally, establish the database connections, where multiple sites and entities are involved.

Testing System Setup

Prior to the initial lean commerce team testing activity, test all facets of the system setup to be reasonably sure there are no hardware glitches that will surface. Be sure to verify that terminals communicate with servers and that all communications software is functioning properly. If there is emulation software, test it also. Include a test of all modems, DSL, and T1 connections, as well as all printers and other peripherals. Test network management software (multiple databases, if installed).

Managing the Data Conversion Process

Begin the management of the data conversion process by reviewing the results and recommendations of the Lean Performance teams. Identify related files from both the new system and the current system. Determine record sizes and numbers. Evaluate field-to-field correlation between the two systems. Determine capability to automate data load where desired for engineering and financial data. Verify the use of database transfer capability. Finalize the method of data load, either manual or automated, or some combination. Use the establishment of the test and training environments to test the conversion routines and programs. Be sure to get process owners and customers to validate data during all testing activities.

Project Result: Data Management/Data Conversion Strategy

Plan the conversion including verification that supporting systems have been converted and are successfully running. Include cutover and timing and its implication (i.e., before MRP, after MRP). Finalize interface issues and testing requirements. Be sure to include preparation of data requirements and impact of any fields that must be manually converted or conditioned. Complete the conversion plan including dates, tasks, and work steps. Determine procedures for converting data. Develop a contingency plan for errors. Publish the data conversion workplan so project team members can review and comment.

Project Result: Final Conversion and Cutover Work Plans

Evaluating Additional Software Packages and Interfaces

Begin to evaluate additional software packages and interfaces that have been proposed by the Lean Performance teams. Be sure to identify related factory systems for quality, shipping, engineering, shop floor, inventory, scheduling, etc., based on lean commerce team input. Determine the use of system FAX capability for supplier management or any other processes suggested by teams. Verify the customer EDI/XML/SOAP strategy. Identify necessary interfaces to accounting, order entry, forecasting, and shipping. Be sure to consider the following:

- EDI/XML/SOAP
- Payroll
- Pitney Bowes Freight Management
- UPS/Federal Express
- U.S. Postal Service

Document the use of appropriate systems technology to support processes, projects, and strategies with identified enablers. Establish contacts and help desk support for third-party applications, and assign process-owner responsibility for all but the system-level setup technical issues. Process owners should be responsible for operating their own process applications and should include process workflow and work instruction documentation of the operation of third-party process support.

The next important task for the information team is to overlay the process area overview diagrams with the system supports for the process areas. Close the loop on all system process support decisions, and present the visual result to the project manager, project team, and steering committee. Verify with all project team members that their applications and processes are included. See Figure 12.1 for an example.

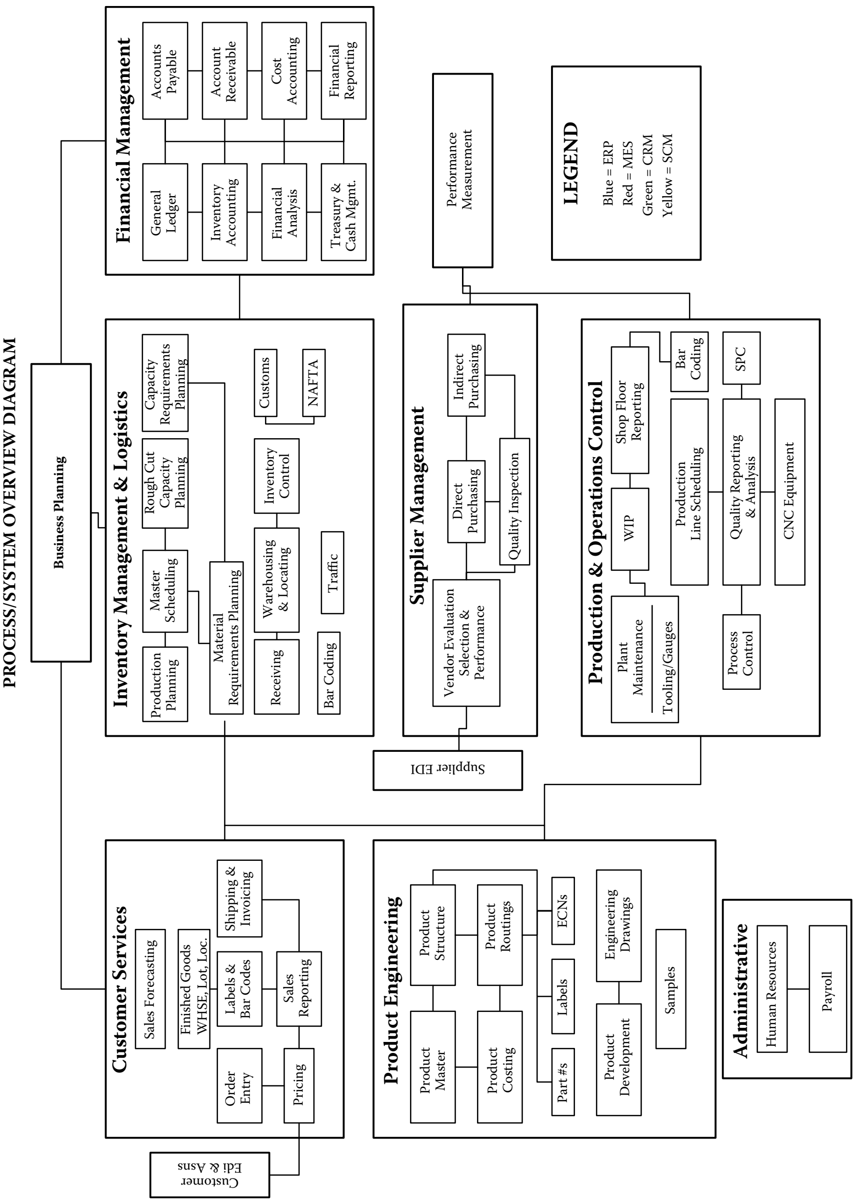

Figure 12.1 Process/System Overview Diagram

Conducting Process-Oriented System Design

When the process/system architecture is finalized, begin to evaluate and plan the modifications programming. The first task in conducting process-oriented system design is to establish standard forms and templates for project documents, including screen and report samples. They should be based on the layout of the standard system software screens and reports wherever possible to ensure a uniform look and ease of functionality when mapping fields to screens and reports. It is always easier to insert fields into "clones" of existing system screens, especially when attempting to maintain system upgradeability using vendor upgrades. But it isn't always possible. There are occasions when a screen contains field references that occupy seemingly available space. Instead of using space reserved by the vendor for a field that your process owners and customers may want to utilize in a future release, build a new screen based on the existing provided screen and reserve the unmodified screen for future use.

Next, you will want to determine forms and methods for documenting technical specifications. Develop examples of the following, based on the process workflow:

- Conceptual design specifications document
- External design specifications document
- Internal design specifications document
- Detail design specifications document

Then organize the system design team. This team will include members of your already existing Lean Performance information team. Be sure to also include temporary hires, contractors, consultants, and vendors who provide services.

Finally, conduct information systems design team training, covering process workflows and work instructions. Be sure that team members are familiar with your design policies regarding wraparounds or outside program calls for insertion of logic, so as not to intrude into system source code. Prepare a standard screen and report design example. Remember, a report that extracts, processes, and presents data is not a modification.

Project Result: Design Team Organization Chart

Summarizing Proposed Modifications

To summarize proposed modifications, begin by reviewing completed process workflow documents and verifying that GAPs cannot be solved by the standard or known third-party available software. Prepare a list of reports, screens, and forms needed to support required process outputs. Prepare samples of all new (cloned) screens, reports, and forms, using representative process data. Be sure to verify the field-level correlations of all forms, including:

- Purchase orders
- Invoices
- Customer order acknowledgments
- Shop paper
- Shippers
- Bills of lading

Review form samples with appropriate users and determine the number of copies of each form that will be needed to perform the improved process. Reduce as much as possible, and modify forms as required, but especially to follow flow of data input anywhere possible.

Perform a review of proposed modifications with software vendors. Verify that the proposed modifications are necessary by researching solutions available from the vendor in current or pending release of software and user group and third-party offerings.

Confirm the potential modifications and estimate time and cost. List any and all proposed modifications to the standard package. Include new and revised data elements, records, screens, and reports, and also include new programs and processes.

Project Result: Preliminary Program Modification Listing

Review the results with the process owners and customers, then revise the estimates. Include timing, cost, and criticality of each modification and enhancement.

Project Result: Revised Program Modification Listing

Determine high-priority items. Develop a programming schedule. Specify those that will and will not be ready before the system go-live date. Review all planned modifications with the steering committee and obtain approval to proceed. Finalize a design team workplan, including time and resource estimates for all tasks to be performed by the team.

Project Result: Design Team Workplan

Prepare a short description of any modifications to standard programs and develop a brief narrative summary of the purpose of any new programs needed. The Conceptual Design Documents can and should be brief. They are only meant to convey the purpose of the modification. Be sure to refer to and include the Lean Performance Analysis that demonstrates and supports the proposed modification. Publish the result to the project team.

Project Result: Conceptual Design Documents

Completing Hardware and Communications Analysis

Review hardware requirements. Review processes and the technical designs for possible changes to the hardware strategy. Redefine hardware requirements by considering throughput issues and storage and communication requirements, including printers, terminals, and PC requirements identified during the process workflow development.

Perform an initial load analysis on the hardware, preferably during the lean commerce team testing process. This is the time to shake things down without a lot of time lost. Hardware and communications problems during the wider Process and Stress Tests will cost more in lost time and damage to the confidence of the project. In order to complete the hardware and communications analysis, review and resolve all open technical issues. Verify the location of each data entry and processing function. Verify all new communication capability, and install data and video communications lines where needed. Review documentation of all updates and changes to current communications capability needed to support the new system. Review and revise the budgeted equipment requirements, including bar codes, fiber-optics, DSL, T1, etc. Complete site preparation requirements, including build-out, air conditioning, and power requirements. Update the Site Configuration Diagrams to present to the steering committee. At this stage of the project, documentation is helpful to close issues, especially those nasty budget issues that may surface when actual project hardware requirements are fully known.

Project Result: Revised Site Configuration Diagrams

Review and resolve any and all remaining system integration issues. Schedule and attend any additional hardware training needed to do this. Bring in experts. Finalize hardware installation budgets and schedules and update and review the hardware strategy changes with the steering committee to obtain approval to proceed. Complete the installation of hardware and software at all sites.

Preparing Detailed Design Specifications

System technical design is performed only after process workflow is complete, and only if a GAP is demonstrated and only if closing the GAP will result in a sufficient benefit. The external design specifications describe any new and revised system processing functions, including definition of modular processing logic as necessary to document key design points. The purpose of the document is to provide for a visual handoff to the next team members involved in the modification, who are often third-party partners.

Project Result: External Design Specifications

Working with the third party or internal resource, develop the database design and describe processing logic and new data elements based on needed system outputs as well as identification of any new logical views or alternate indexes of the data required. Describe the revised physical database and proposed modifications with the software vendor. Often, the software vendor can save you time and money in applying modifications, and the vendor may be interested in adding your modifications to their package as standard code. If the vendor adds your modifications as standard code, obviously the burden of carrying your modifications forward to future versions is gone. The vendor will do it for you. Be sure to identify the contents of any temporary files or interfaces, or other system tricks, if there are going to be setup, test, or run issues with your environment when the modifications are in production.

Project Result: Internal Design Specifications

Modification documentation in hand, review the result of the modifications with the process owner driving it. Use updated process workflow and work instruction standards. Be sure to have the technical personnel assigned present, but make the runthrough from the process owners' perspective. This will help cut down on "but I thought you said" problems later. Verifying a design to the process intended to use it is a lot of work upfront, and a lot less work later, when management is watching a live environment with bugs or process GAPs based in poor communication. Finalize user-approved samples of new screens and reports. Complete forms design for any forms called for in the process, if needed.

In the Lean Performance project, system technical design completes development of software improvements to close documented system GAPs, completion of site configuration schematic and hardware listing to reflect final project configurations, planning, programming, and testing of data conversion and interface programs, and the installation and testing of software and communications capabilities.

Managing Outsourced Programming

Unless your enterprise intends to enter the software business, resist the temptation to start hacking away at the software, especially if you intend to implement to any project schedule. The better path is to determine vendor outsourcing requirements and establish a vendor selection and control process. Prepare packets for vendors. Include conceptual, external, and internal design specifications, and then select vendors. Outsource a revised internal design analysis for any modification proposed. Be prepared to pay for it, and make no promises of follow-on work to the vendors. Let each step stand alone, and require all estimates to be documented. Then determine who will do the programming. Require documentation at every step of the process, and supervise vendor development of program detail design specifications.

Project Result: Detailed Design Specifications

Supervise programming while the vendor codes program specifications. Review and approve vendor unit tests. A unit test is a simple demonstration that the individual program performs as specified in isolation from any other functionality.

Project Result: Unit-Tested Programs

Defining Interface and Database Testing

Determine the testing requirements for the new system, interfaces, and conversion programs. Evaluate sources of data required for database input or conversion. Identify manual procedures required for data input. Identify site preparation requirements (if any) associated with data input to the system. Identify resource requirements for data input and conversion.

Project Result: Final Software Specifications, Documents, and Testing Requirements

Gather all project documents and updated diagrams for a Quality Assurance Review. Following the Quality Assurance, review results to date with the project team, then conduct a review with the steering committee.

Chapter 13

Testing Improved Processes Module

Project Team Tasks

Objectives of Testing

The Lean Performance Improvement tasks of the project are being completed. Designed modifications that will be included in the live system have been received and preliminary tests conducted. No other modifications should be performed until 90 days of live stable system operation have been realized. The system as it will be used live is now available for further testing. Although the lean commerce team has conducted some tests on customer-facing processes, the testing cycle should now be expanded to include the users at the manufacturing plants and at corporate headquarters. Plant and corporate teams will test the software during the prototype/pilot, process, and stress tests. Successful completion of these tests will verify that the processes that perform the work are understood, that these processes have been improved and can be successfully accomplished with the new software, and that the manual workarounds that have been developed in lieu of modifications will work.

There are three primary objectives for testing. The first is to move testing from the Lean Performance teams to the wider user base of the manufacturing sites. The second objective is to ensure that the data, programs, processes, and hardware can support daily business. The final objective encompasses the need to conduct our final testing of the improved processes with the users of the improved processes fully involved so that any odd or exceptional circumstances can surface now, rather than during live operations. This is accomplished by utilizing actual plant data to exercise the software, entering transactions in the manner in which they are performed. In this manner, we are performing testing with the process owners, operators, customers, and other system users fully involved. A number of secondary goals of the tests are also accomplished, including data validation and on-site testing of all programs, hardware, and networks. Team members also validate process workflows and work instructions and provide initial hands-on training. The information team attempts to ensure system stability and verify system control settings while developing audit procedures for critical data and establishing tolerances where necessary for data calculations such as unit of measure conversion and standard cost calculation variances.

Prototype and Pilot Testing

Prototype and pilot testing is conducted at the conclusion of Lean Performance Analysis, prior to the process and stress tests, to ensure that the system is functioning adequately for the more involved additional testing. The prototype and pilot test is performed using a controlled script, a "Roadmap," that ensures that all system functions are tested in a sequence reasonably mirroring the go-live configuration. Often, these are available through the software vendor or from a third-party source. If necessary, develop your own by reviewing system menus and developing a path or roadmap through the essential system transactions. Figure 13.1 provides an example.

The pilot and prototype test should be performed by Lean Performance team leaders. We will involve all the process owners later on in the full process testing, but for now we are attempting to validate software system functionality, not software process applicability.

To conduct the prototype and pilot test, utilizing a prepared "Roadmap" test script, be sure to load data using test data conversions or process data conversions as they will be utilized at system cutover. Initially, confirm the usability and integrity of individual screens and functions using a single-level assembly BOM. After the initial single-level test is successful, expand the test to include a subassembly BOM level. Finally, run the test cycle with a full product structure. Present the test results to the full project team in a team presentation.

Project Result: Prototype and Pilot Test Results

Establishing the Test Team

Plant test teams should be established to conduct much of the testing. Project management should provide overall test coordination in order to coordinate test cycles,

PILOT/PROTOTYPE TEST ROADMAP

DATA-BASE REVIEW ACTIVITIES

Organization ____
Plants ___ and ____

Print and verify completeness and accuracy of system data for assemblies selected for testing activities:

Assembly Selected :

XXXXXXXX-XXX

Print	Screen
Multi Level Bill of Material Report	AAAA
Routing Master Listing	BBBB
Inventory Planning Data Listing	CCCC
Inventory Master Listing	DDDD
Work Center Listing	EEEE

Verify

Completeness of Items on BOM

Accuracy of Items on BOM

Update BOM asnecessary

Completeness of Routing Operations

Accuracy of Routing Operations

Update Routings as necessary

Completeness of Inventory Planning Data

Accuracy of Inventory Planning Data

Completeness of Inventory Master

Accuracy of Inventory Master

Completeness of Work Center Data

Accuracy of Work Center Data

User Tables

Figure 13.1a Pilot Prototype Test Roadmap

assist with problem resolution, and deploy resources needed to support plant teams. All team members should be involved in the final review of the testing activity prior to go-live with the new manufacturing software.

PILOT/PROTOTYPE TEST ROADMAP

<u>SYSTEM SET-UP ACTIVITIES</u>

Review current systemplanningstatus	FFFF
Print a Planning/Scheduling Report	GGGG
Review currentsystem production plan	HHHH
For each product	
Set - up Planning Forecasts Through December	IIII
For each product	
Enter a very low month forecast that we can consume using same month customer orders as we enter them.	
Review Customer Master Data for Customer _____	JJJJ
Update Where Necessary	KKKK
Review Customer Credit Maintenance	LLLL
Update Where Necessary	
Review Price/Contracts for Customer _____	MMMM
Update Where Necessary	NNNN
Set-up Safety Stock/Beginning Inventory	OOOO
Set MRP control fences at Zero by plant	PPPP
Review Multi-Plant Setup/Correct Where Necessary	QQQQ
Multi-Plant Plant Definitions	RRRR
Multi-PlantTrading Definition	SSSS
Multi-PlantControl Maintenance	TTTT
Multi-Plant Location Type Maintenance	UUUU
Review Product Costing	
Run Incremental Cost Calculation	VVVV
Run Accumulated Cost Rollup	WWWW
Review Labor/Machine Rate Code Maintenance	XXXX
Review Product Cost Listings	YYYY
Single Level Product Cost Report	ZZZZ
Multi Level Product Cost Report	aaaa

Figure 13.1b (Continued)

PILOT/PROTOTYPE TEST ROADMAP

TEST CYCLE 1

Load Sales Forecasts for Month______	bbbb
Week _1___	
Week _2___	
Week _3___	
Week _4___	
Week _5___	
Enter Customer orders for each product	cccc
Enter Only for weeks __1__ and __2___	
Customer ____	
Each part/for each week Use quantities both less than and greater than forecasted (mix them up)	
Be sure that order is not on hold or at incomplete status	
Review impact of orders entered on planning inquiries	dddd
Review impact of orders entered on Planning/Scheduling Report	eeee
Review impact of orders entered on planning maintenance	ffff
Review impact of orders on customer inquiries and listings	gggg hhhh iiii
Run Low Level Code	jjjj
Correct system demand data as necessary. Set-up and run MRP	kkkk
Review system planning status	llll
Print a Planning/Scheduling Report	mmmm
Review impact of orders entered on planning inquiries For Each product	nnnn
Review impact of orders entered on Planning/Scheduling Report	oooo
Review impact of orders entered on planning maintenance	pppp
Review Multi-Plant Requirements Inquiry	qqqq
Review Multi-Plant Shipments Inquiry	rrrr
Review/Revise Multi-Plant Order Print Flag Maintenance	ssss

Figure 13.1c (Continued)

PILOT/PROTOTYPE TEST ROADMAP

TEST CYCLE 1 cont.

Review Production Planning Maintenance for Global Orders	
Production Planning Maintenance (FG)	ttttt
Production Planning Maintenance (Component)	uuuu
Item (FG) Inquiry	vvvv
Item Component Inquiry	wwww
Review Planning/Scheduling Inquiry	xxxx
By Department	
Perform Production Planning Maintenance For Global Orders	
Release Week __1__ - __2__ orders	
Production Planning Maintenance (FG)	yyyy
Production Planning Maintenance (Component)	zzzz
Item (FG) Inquiry	1111
Item Component Inquiry	2222
Review Production Planning/Scheduling Inquiry	3333
By Department	
Print a Planning/Scheduling Report	4444
Submit Requisition For Spot Buy	5555
Approve Purchase Requisitions	6666
Process Requisitions to P.O. Line Release	7777
Receive Purchased Material	8888
Simulate and report pay for production for each motor.	
Report Week __1___ orders	
Labor/Production Entry	9999
Finished Goods Receipts	1010
Review Journal Entries	1212
Reverse several transactions.	
Operation Backflush Transaction Reversal	1313
Labor Transaction Reversal	1414
Material Transaction Reversal	1515
Review Journal Entries	1616

Figure 13.1d (Continued)

PILOT/PROTOTYPE TEST ROADMAP

TEST CYCLE 1 cont.

Process Scrap Transactions	1717
Process Disposition Entries	18118
Process Material Issues	1919
Perform Multi-Plant Requirements Maintenance	2020
Perform Multi-Plant Order Consolidation	2121
Perform Multi-Plant Shipments	2323
Perform Multi-Plant Order Print	2424
Perform Multi-Plant Receipts	2525
Review Multi-Plant Requirements Inquiry	2626
Review Multi-Plant Shipments Inquiry	2727
Set Pick List Print Flags	2828
Set Packing Slip Print Flags	2929
Set BOL Print Flags	3030
Perform Ship List Maintenance For Week __1__ Orders	3131
Print Shipping List	3232
Perform Telzon Upload	3434
Perform Pick List Maintenance For Week __1__ Orders	3535
Print Pick List	3636
Perform Ship By Pick List For Week __1__ Orders	3737
Print Packing List	3838
Print Bill of Lading	3939
Perform Telzon Download	4040
Review ASN processing.	

Figure 13.1e (Continued)

PILOT/PROTOTYPE TEST ROADMAP

TEST CYCLE 1 cont.

Review impact of orders shipped on planning inquiries	4141
Review impact of orders shipped on Planning/Scheduling Report	4242
Review impact of orders shipped on planning maintenance	4343
Review impact of orders shipped on customer inquiries and listings	4545 4646 4747
Simulate and report pay for production for each motor.	
Report Week __2__ orders	
Labor/Production Entry	4848
Finished Goods Receipts	4949
Review Journal Entries	5050
Reverse several transactions.	
Operation Backflush Transaction Reversal	5151
Labor Transaction Reversal	5252
Material Transaction Reversal	5353
Process Scrap Transactions	5454
Process Disposition Entries	5656
Process Material Issues`	5757
Perform Ship List Maintenance For Week __2__ Orders	5858
Print Shipping List	5959
Perform Telzon Upload	6060
Perform Pick List Maintenance For Week __2__ Orders	6161
Print Pick List	6262
Perform Ship By Pick List For Week __2__ Orders	6363
Print Packing List	6464
Print Bill of Lading	6565
Perform Telzon Download	6767
Review ASN processing	6868

Figure 13.1f (Continued)

An announcement should be sent to all test participants outlining the pilot/prototype, process, and stress test activities and schedules. Plant team leaders and coordinators should be selected to prepare for the kick-off session and should assume the responsibility for determining or confirming plant process owner assignments. Plant team leaders should also gather one day of data for the initial test cycle.

Rosters for plant teams should include:

- Plant team leaders
- Plant team process test coordinators
- Plant process owners
- Lean Performance team leaders from all teams
- Test support resources, including consultants

Rosters for plant teams should include information systems/support resources. At least one information systems resource person should be assigned to each session scheduled and should be on call. Information systems test leaders should be assigned to coordinate rosters, schedules, and activities with the information team. They should report results of the tests to all information team members. Test leaders should be at each session in the initial cycle. The developer, including vendors responsible for any modified program, should be on call for any reasonably scheduled session dealing with that program.

Test Team Kick-Off Meeting

At the kick-off meeting there should be an introduction presented to all attendees that discusses the process and stress testing, including objectives and goals and the structure and schedules of the test activity. Plant team members should review and confirm initial plant operating cycles (start-end, MPS generation, MRP generation, etc.). They should be prepared to review and confirm rosters and assignments, test setup activities, and the process groups that will be used in the initial test cycles. I will discuss the establishment of process groups below.

Team members should review and confirm the schedule for the initial test and review forms and procedures for use in tests. Team leaders should issue instructions to plant process owners and customers to identify and collect documents before the initial test cycle. Each plant should select its own documents/data for each test cycle. A progress-reporting procedure should be discussed, including a daily conference call between plant test teams. Tests should be conducted in plants, at user workstations as if the processes were "live."

Participation in the system stress test should also be confirmed, and dates and times established. Clarification of the test procedure should be provided, including the provision that each team member selects a transaction for repeated data entry continuously during this time to "stress" the system.

Process Test

The Process Test is conducted utilizing the process workflow standards developed by the team members. The primary activities of the Process Test are the testing of process workflow standards and the finalization of process work instructions.

On a daily basis, the test teams will review progress by plant and post and resolve open issues. They should also schedule the nightly supporting batch processes. Setup activities and information support should be performed, including loading of data from the preproduction environments, if utilized, into the test environment. Responsibility assignments should be established for the test setup tasks, including data loading, setup tables and validation, and security. Data in the test environment should be managed with the backup/restore procedures defined in the information systems daily operations schedule, as though the system were live in order to test those processes. All "end of day" processes, interfaces, backups, and batch processes should be established in the information systems operating schedule and performed to that schedule throughout the test cycle. Data setup testing should include a full EDI/XML/SOAP data load and an MPS/MRP generation. All users should be verified. All information systems processes and documentation should be fully tested, with information systems personnel assigned to all system operations as though they were live. Completion of all setup activities should be verified prior to the test. "Go/no-go" procedures should be followed. A final project team meeting should be held to ensure that preparations are complete. Equipment readiness should be verified. Data readiness should be verified. The entire company should be notified of the testing activities and schedules.

Managing MRP processing is a critical issue for the testing process, in that data expectations for material planning, use of BOMs, and work center and cost information is all dependent on system generations. During the test, MRP full generations should be run only after the day's testing ends and only as approved during the daily afternoon review session. MRP partial generations on new or items with new demand activity may be run between testing cycles (12:00 p.m. and 4:00 p.m., when required to continue testing), only with full team agreement. The concern here is not to disrupt or penalize those testers who are proceeding through a cycle involving data validation.

Goals for each test session should be established, and a checklist completed identifying the percentage of goal completed. There should be a morning daily conference call between plant test teams to coordinate activities and an afternoon daily conference call to report results. Tests should be conducted in using plants at user workstations. The test team should enter actual transactions that will simulate a day's business. During and after the entry of transactions, reports and queries should be utilized to validate the results.

Prior to the initial test cycle, all setup requirements should be confirmed. The open issue log should be reviewed. Data collection activities at each plant should include all documents that can be used to recreate a day's business. Check the need to utilize the following:

- EDI order report
- Returned materials
- Credit memos
- Shipping lists
- Inventory reports
- Weekly production plans
- Bills of lading
- Scrap tickets
- Pick lists
- Packing slips
- Invoices
- Production schedules
- Pay tickets
- Debit memos
- Sales and operating plans
- Consigned material shippers
- Consigned material receivers

The open issue log should be maintained centrally and reviewed before each session, with categories/types of open issues and problems categorized and listed as before:

- System operations
- Bug
- Modification not working
- Modification needed
- Business decision/policy needed
- Workaround requires an additional headcount
- Process workflow/work instruction needs update
- Training needed

The regular daily cycle for order entry through shipping should be defined by each plant team, with the activities that occur at regular (weekly, monthly) intervals noted where and when they occur within the regular daily cycle. The plant teams should note the differences between the various months in the overall business cycle (i.e., quarterly, semiannually, or yearly events).

The plant teams should gather the supporting documents utilized to generate the transactions and retain those documents throughout the first 30 days of live system processing. This should include copies of all data input documents utilized to process a day's worth of business initially, and eventually represent one week's normal business.

During the test, teams should resolve the differences between plants for global system processes. Issues such as "How often will we run MRP?" and any other that arises should be resolved. During the test, teams should determine requirements for information support. The information support schedule should be refined from these activities, and any conflicts between information support capabilities and plant requirements should be resolved. Each plant should select its own documents and data for each test cycle, including parts, customers, etc. Each plant should have a full set of process workflows and work instructions available at the start of the test. Completion of all setup activities should be verified prior to the test. Equipment readiness should be verified. Data readiness should be verified. The company should be notified of testing activities.

Test cycles should proceed with the initial system demonstration test cycle consisting of limited, selected data (one or two selected processes, several customer orders, etc.) that will be processed by one plant team as part of the planning and training for this exercise. The initial test cycle should consist of one day's data being entered by each plant team according to a schedule.

The plant chosen will begin the test. When that plant has successfully completed one cycle, the next plant should begin. Each successive plant follows as the plant scheduled before it finishes. When all plants have completed successfully, the first plant begins to process cycle 2. When all plants have completed all cycles, the initial test should end. Results should be reviewed and validated.

The second test should expand the activity to include all plants entering data, by group, simultaneously. At the conclusion of each cycle, results should be reviewed and validated.

The third test should consist of the initial plant entering all data, for all cycles, throughout the period by all users simultaneously. When that plant finishes, each successive plant will follow as the plant scheduled before it finishes.

The fourth and succeeding test should consist of all plants entering all data, for all cycles, simultaneously by all users, on each business day remaining before cutover, for all activities.

Process groups are suggested as a starting point for the development of logical test cycles. Each test team should determine its cycles according to the daily and weekly operating cycles in that facility. A process group should consist of all the processes governed by a Lean Performance team. For example, cycle 1 processes could consist of:

- EDI/XML/SOAP order load
- Order entry
- Shipment initiation
- Production reporting

Following that, cycle 2 could build to include:

- EDI/XML/SOAP order load
- Order entry
- Scheduling
- Component scheduling
- Build and pay with bar code (production reporting)
- Shipment initiation
- Shipment processing

Following the initial two cycles, cycle 3 could include:

- EDI/XML/SOAP order load
- Scheduling
- Vendor scheduling and releasing
- Receiving
- Build and pay with bar code
- Shipment initiation
- Shipment processing

Additional cycles should test all processes on the Process Master Index. There can also be specific cycles for each cross-functional team. The following types of activities should be included in the testing process for the Lean Performance finance team:

- An order with multiplant demand on the manufacturing plants
- Cross-plant routing with part coming back to the original plant
- Outside operation of service at vendor
- EDI, XML, or SOAP invoicing

The following processes could be included in the testing process for the Lean Performance materials team:

- Bar-code incoming and outgoing
- Physical inventory

The following processes could be included in the testing process for the Lean Performance operations team:

- Department schedules
- Outside operation department schedule
- Scrap and re-op tickets including reversals
- Interplant moves without MRP-driven action or order records

- Split air/truck shipments by overriding traffic routing
- Corrections of shipping documents
- Shipment of multiple item numbers
- Ship interface testing where applicable
- Print documents on equipment to be used live
- Test ASNs
- Customer/vendor return material process
- Quality on-hold and off-hold processes

The following processes could be included in the testing process for the materials team:

- Daily pricing process
- Sales analysis process
- ASNs
- Automatic order pull
- Test of firm and forecast orders
- Purchasing EDI/XML/SOAP

The following processes could be in the testing process for the engineering team:

- Coordinating engineering change process
- Testing material multiple change using effectivity on same BOM revision level
- Testing master assembly drawings as phantoms

There should be a constant information change during test cycles, with processes performed in nonsequential order. Additionally, any special cases at each plant that may impact system operations should be tested.

Project Result: Process Test Results

Stress Test

Participation in the Stress Test should include all members of the user community. In the Stress Test, each user selects a transaction for repeated data entry continuously to “stress” the system.

The Stress Test announcement should also specify that all process owners and customers as well as all other system users will participate in the system Stress Test on an assigned date and time.

Prior to the Stress Test, the system environment security should be reset to put the participants into the proper environment upon sign-in. The initial daily IS operating cycle should be determined during the test process. The offline programs, batch, backup, restore, and interface download timing should be determined. One full process test cycle, in at least one plant, must be completed before the Stress Test can be performed.

In the Stress Test plan, document how, when, where, and who will confirm the hardware load analysis, test all downloads, interfaces, conversion programs, and data transfers at expected system operational load volumes and beyond. Determine who will test all system operations procedures and scenarios, including backup, recovery, security, and daily/weekly or other batch or offline system programs and generations.

Note all test scenario and conditions response times and operational problems, and follow up with corrections and repeat the test until satisfactory results are obtained.

Project Result: Stress Test Results

Process Workflow and Work Instruction Update

All process workflow and work instructions must be available for review on and printing from a system drive accessible to all Lean Performance team members. Process workflow and work instructions that are distributed with the training agendas and packages are at "preissue" level. They are subject to change and improvement during the test process being conducted by team leaders and process owners and customers.

Before the process test, each plant team participating should designate a member as document coordinator. This person will note and collect changes, revisions, updates, and improvements to process workflows and work instructions. Changes determined during testing and training sessions should be noted by team leaders and given to document coordinators for input. Document coordinators will ensure that appropriate changes are managed.

When an individual plant proposes that a separate process be developed for that plant only, the document coordinator will review the request with the project manager for a decision. Where the task structure on a process must be changed, the document coordinators must coordinate with all affected plants to determine if the change dictates that a separate process workflow be developed for that plant only. Document coordinators should make the changes to process workflows. Changes to work instructions should be done by technical writers, if available. System user comments collected during the user training program and change requests generated during process testing should be reviewed prior to formal issuance of process workflows and work instructions, to identify process changes required and make any necessary process documentation changes.

Project Result: Network–Resident Process Workflow and Work Instruction Standards

Conducting the User Training Program

There are four important steps to take in preparing and conducting an effective user training program. First, plan the user training program thoroughly to ensure that all departments, process owners, process operators, process customers, and system users are adequately trained to successfully operate and support the new system. It may be necessary to repeat some of the earlier classes held for new hires, replacements, and stragglers. Second, utilize the process workflow and work instruction standards for all training sessions. This ensures that the training is accurate to the system and helps the company trainer monitor the updating of the training material. Third, prepare an agenda for each training session that includes instructor information, Process Standards to be utilized, major topics, and schedule and location information. Finally, publish the user training plan on the project Web page. The training assignments spreadsheet can be reworked for this purpose. The project chat room can be utilized to expand access to user training program information.

Project Result: User Training Plan

A focus of the training sessions should be to record comments and issues from the system users as the most credible basis for declaring the system ready for go-live. Once again, gather all project documents and updated diagrams for a Quality Assurance Review. Then, distribute the updated documents to the project team, and review the project results to date with the steering committee.

What Follows Lean Performance Improvement?

Phase 3, Continuous Lean Performance, follows the phase 2 Lean Performance Improvement activities. In this third and final project phase, all project implementation tasks remaining are identified and prioritized. Process and system GAPs are closed. Process measurements are implemented. At the conclusion of the project, Lean Performance Management is implemented, and process continuous improvement activities are a reality in all processes.

IV

CONTINUOUS LEAN PERFORMANCE MODULES

The third and final project phase, Continuous Lean Performance, begins as phase 2's Lean Performance Improvement activities are being completed. By this time, improved processes are operating in and across the enterprise. The project manager and Lean Performance project team are confident that they have initiated a Continuous Lean Performance culture, not just a few isolated, obvious successes. The key indicator that Continuous Lean Performance is ongoing in a given process area is the existence of formal (written) Process Standards. When process workflow and work instruction standards are formalized, they can be analyzed and maintained as the basis for managing and continually improving processes. The current standard is always the interim target to be used for further improvement.

As continuous improvement becomes a "way of life" in the company, there should also be a transition to a continuous top-down policy deployment, bottom-up continuous improvement cycle. As Lean Performance expands across the cross-functional and cross-enterprise processes, layers of management can be stripped away. Managers become coaches and problem solvers for proactive physical and information/support process workers. New management positions result: some emerge on a product line management basis, others on a process-area basis. I will explore various lean enterprise management positions in this section.

Another indicator that Continuous Lean Performance has become a part of your firm's culture is verified by the prevalence of workers employing continuous improvement practices to initiate improvements without management intervention or direction. A final sign of a continuous improvement culture is that all continuous improvements are being recognized and rewarded as key employee attributes incorporated in employee evaluations and compensation. In order to be sustained, continuous improvement recognition and reward must be organized and managed as a permanent set of corporate human resource management activities. It is essential to establish these lean human resource practices in order to maintain the momentum of Lean Performance, and a minimum continuous improvement effort is necessary just to *maintain* processes and systems in place as they are at project end.

In this final project phase, general management-level decision processes become the important focus. Previously existing departmental reporting structures must be subordinated to newly emerging cross-functional and cross-enterprise processes and the necessity to manage and support them. The implementation of these lean processes has changed the organizational structure and management reporting requirements, and these management changes must be formalized in order to be sustained.

As lean processes become operational, they must be organized and managed by ongoing management decision processes. These management processes must also be "lean," meaning that standardization of management decision processes must take place, including development of Process Standards documentation. As in the case of the physical and information/support process standards (workflows, work instructions) developed previously, methods of measurement and data collection must be incorporated in the management decision Process Standards as well. Management reports should be formatted to document lean evaluation criteria and review procedures, including criteria to relate pay and other compensation to firm performance (lean HR management).

Lean organization and management methods must now become the dominant way of structuring and operating. For example, lean education and training must be integrated into the existing education and training function. Another example is the development of lean accounting methods (i.e., MUDA-free costing) as the basis of periodic management reports.

Chapter 14

Implementing Improved Processes Module

Management Tasks

Maintaining Lean Performance Teams

Many emerging lean firms reorganize by product family when the initial lean processes are formalized, implemented, and are being managed on an ongoing basis. Although various personnel decisions may have been made during the life of the project, at this stage implementing additional personnel reductions or removing any remaining anchor-draggers can destroy the emerging lean teamwork in the enterprise. Maintaining commitment to the initial lean cultural principles is essential to sustaining the lean enterprise, chief among which is the maxim that no one loses their job for implementing an improvement, and their coworkers don't lose their jobs either. At this stage, everyone is viewed as having implemented improvements, and normal attrition and team-based evaluations are the vehicle of choice for eliminating nonteam players. The teams will weed these folks out in a hurry.

Formal process teams, organized by product family where feasible, have by now become the norm. Excess personnel can be assigned variously, until company growth and normal attrition can absorb them. For example, additional Lean Performance teams may need to be redefined for system implementation of the ERP, OPS, MES, CRM, SCM, or other system enablers driving the project or recently deployed in the project. Additional Lean Performance teams that can be defined for improved process implementation might include teams managing the accuracy and usefulness of bills of material and routings, or a team monitoring inventory accuracy.

These implementation Lean Performance teams can provide system stability. Recommendations for additional Lean Performance teams that might be needed are developed during the first Implementation Readiness Assessment. Membership is formulated considering skill level required to perform tasks documented in the implementation work plan and also the new tasks defined in the improved processes. I will examine the objectives and tasks of several possible implementation Lean Performance teams next, including the:

- Bill of material team
- Financial data team
- MRP data team
- System user team
- Process documentation team
- Steering committee policy team
- Data accuracy team

An initial meeting should be held with each Lean Performance team to review each team's implementation workplan, the tasks for which are derived from the open tasks identified in the readiness assessments. Each Lean Performance team should estimate the work days required to complete team tasks and confirm the expected completion dates for each task on their workplan. Each Lean Performance team also should develop a team objectives definition. A weekly team meeting schedule is established to report status and identify open issues. Before the weekly meetings, each Lean Performance team identifies, records, and resolves implementation issues utilizing the open issue format and the Lean Performance Analysis. Team leaders meet cross-functionally to review status of open issues and provide resolution to them, or to seek resolution through newly emerging cross-functional and cross-enterprise process managers. I will discuss these positions in detail below. Weekly team reviews with project management are also held to report status and identify open issues needing further attention. The teams will determine methods and reports to be used to audit data. All teams should use central data; there are no exceptions. If necessary, new reports can be developed for team use. Teams should also revise or prepare process workflow standards and work instructions to ensure Continuous Lean Performance that is ongoing.

The primary objectives of the bill of material team are to determine the methods and data to utilize to audit BOMs, to coordinate with affected process experts, to assign audit responsibility, to train the assigned personnel, and to implement the BOM audit process. The team should also identify and correct problems in the process as required and measure and report BOM accuracy as part of the performance measurement process. BOM team members should include a representative from engineering, operations, materials, and accounting.

The objectives of the financial data team are to determine the validity of critical transactions and financial data as currently processed by the system and to develop and perform data and logic testing where necessary. The financial data team should also design, develop, test, and implement additional information/support processes and system capabilities where required to achieve valid financial data and reports. Members of the financial data team should include representatives from materials and plant-level accounting, as well as members from finance and audit.

The objectives of the MRP data team are to determine validity of critical system transactions affecting MRP processing, to validate MRP results as produced by the system, and to develop and perform data and logic testing where necessary. The MRP data team should also design, develop, test, and implement additional information/support processes and system capabilities where required to achieve valid MRP data. Members of the MRP data team should include representatives from materials and plant-level accounting as well as finance.

The objective of the system user team is to survey initial system implementation results by performing user surveys focusing on two categories: winners and concerns. Winners should be reflected in the process performance measurements. An initial recognition of winners should be published for the entire firm to see and recognize. Concerns are really more the ongoing focus of this team. Any concern about system viability should be formalized by developing and initiating an open issue, especially for any concerns requiring further action. This should include critical system improvements. The system user team should also assist the project manager to analyze open implementation issues reported and to determine priorities of non go-live issues. Team members should attend software vendor user group conferences and research available software offerings, current releases, future planned releases, etc.

The system user team should also determine the regular daily operating cycle for each plant, for the order entry through shipping processes. The members of the system user team are best positioned to note differences in activities that occur at regular (weekly, monthly) intervals, and to use this analysis to determine requirements for offline processing and to establish the daily operating requirements necessary for IT to support plant activities. This team should also determine and support all reporting requirements for plant-level management reports as well as performance measurements. It should determine the IT operating cycles for daily, weekly, monthly, and yearly activities, including all interfaces, downloads, backups, and batch processes. It should publish guidelines and a change management process to manage those proposed changes. I will discuss a change management process below. Finally, the system user team should provide input to the trainer to assist in the development and maintenance of the ongoing system. Members of the system user team should include a leader and process-area representatives.

The objectives of the process documentation team are to finalize system documentation so all process workflows and work instructions are up to date to the final system implemented, and to format and complete all system documentation so that it meets QS 9000 or ISO standards, and determine effective use of system documentation to assist in ongoing training activities. Members of the process documentation team should include the project trainer, facilitator, information systems analysts, quality assurance representative, and a representative from the steering committee.

The objectives of the steering committee policy team are threefold:

1. To complete the necessary business policies to manage the system
2. To coordinate documentation of those activities with the process documentation team to ensure that formats and standards are met
3. To certify the completion of the project to the steering committee so the transition to Lean Performance Management can be recognized and the project concluded

The steering committee policy team should include representatives of all process areas or their process cross-functional or cross-enterprise managers, including those from sales and marketing, engineering, customer relationship management, information systems, materials, purchasing, and finance.

The objective of the data accuracy team is to develop and implement data accuracy activities and measurements for critical system-operating data, including BOM accuracy, routing accuracy, and inventory accuracy. Members should be from engineering, materials, and finance and there should also be operating-level system users and supervisors.

Immediately after implementation, the project manager should hold an Implementation Review in each project site. During the Review, a winners/concerns survey should be distributed, and all implementation Lean Performance teams announced. The system user team should be designated to follow up and begin to monitor ongoing system results and open issue priorities. Each team should begin to develop a workplan, with the assistance of the project manager and facilitator.

Implementing Lean Performance Management

Lean Performance Management is different from value-stream management in that a lean transformation that begins with an assumption that the enterprise will be organized by value streams assumes that there is a sufficient ratio between product volume and necessary facilities and personnel that will allow the concentration of management effort by segmented value streams.

Value-stream management does not include the strict tenet that all managers must manage a single product value stream—in fact that is the “simple case,” one possible only in a lean enterprise that has either very few products or very high volumes of every product or product family. It is often the case that physical flow value-stream management is more readily possible than "office process" VSM, where multitasking knowledge workers are already performing tasks across several "product/product family" streams, and it is a backward (and costly) step to respecialize them. It may be "faster" but that doesn't mean it's leaner.

Toyota developed Quality Function Deployment (QFD) to organize the process stream, and some lean educators have renamed this the value stream, all the while conceding that the MUDA content in most value streams is 85 percent. As earlier stated, wouldn't that make it the MUDA stream? Lean Performance references the process stream as the organizational principle because this approach allows the enterprise to be process oriented from the beginning of lean transformation. Process oriented, or process focused, is the key to successful transformation because the lean tools are applied at the activity process level by the process owners and operators who own and operate those processes.

Although Toyota operates in a process stream fashion by model, not all manufacturers or service providers can succeed utilizing this organizing principle. If your enterprise can succeed in a product stream organizational structure, terrific.

A lean enterprise that can organize by product or product family value stream is able to make this strategic decision from a thorough QCD evaluation. There are, however, many enterprises beginning the lean transformation that do not believe that they fit the value-stream model. It is not always possible to make a case for the first step in transformation to be a reorganization to value-stream management. It is becoming apparent that not all organizations—in fact, the majority of organizations—do not fit the "simple case" of product/process stream management. Enterprises that produce complex combinations of finished products do not lend themselves to a "product stream" approach. There is simply not enough volume by product or product family to staff to that structure. These organizations produce a multiplicity of goods and services for a large number of customers who each have individual product or service specifications. They produce "cats and dogs" rather than just one primary entity or they are a "custom" shop. A recent seminar participant thanked me for "not ramming that 'organize by product or family' idea back down my throat again. I run a true job shop, and that doesn't work for me." He went on to clarify that his product flow was all "cats and dogs" and that he almost never worked on the same product more than once. A better suggestion for him is to view the "process stream" that a typical product flows, like cut to turn to notch to knurl, etc.

A Lean Transformation project/process can be organized initially by process area, as long as the process areas identified do not mirror the current organization chart and Lean Transformation teams are cross-functional. If it is the case that your enterprise is a true job shop, then follow our job shop example and organize by process stream. At any point in the transformation or later this issue can be reevaluated. You can always take this step when it is the next obvious and right thing to do—like when lean has taken hold and the obvious new organizational structure is emerging.

As lean processes are implemented, the Lean Performance project enters the ongoing activities of the firm. Process changes have impacted ongoing operations in both anticipated and unanticipated ways, including some negative or dysfunctional ways.

Management is the key player at this point in the transformation because organizational issues must be addressed. As the Lean Performance project ends, management must maintain the momentum toward the lean enterprise by disbanding the project steering committee and implementing Lean Performance Management. The first tasks for the Lean Performance Management team are to develop and publish the company policy for employee retention in a continuously improving lean enterprise and to devise a growth strategy that incorporates vendors and customers. A company approach to monitoring lean process performance measurements, staying current on new lean strategies, practices, and technologies and continuously deploying management policy must be initiated to drive new lean strategies, practices, and technologies into the organization at a process level.

The project structure should be replaced by a new Lean Performance Management structure as soon as the characteristics of Continuous Lean Performance have demonstrably taken hold. The steering committee should transition into the Lean Performance Management team. Process area coordinators should still be responsible for monitoring and evaluating progress in their respective areas. They may become process managers or cross-functional or cross-enterprise process managers, positions that are described in some detail below.

Lean Performance management is based in the expectation for sustained continuous improvement in all processes in the organization. Continuous improvement is under way in administrative and operational processes, management processes, and processes delivering any aspect of products and services. Management's participation in the Lean Performance project has been performed as a set of processes. Lean Performance Management in the Lean Enterprise must also be identified and performed within a set of processes. "Of all the processes in an organization, management processes are the most poorly defined, and least likely to be viewed in process terms. Indeed, some would argue that the term 'management processes' is an oxymoron" (Davenport, Thomas H., *Process Innovation*, Boston, Harvard Business School Press, 275, 1993).

There are three views of the management "art." The first view is that management is a personal activity that cannot be described in a process definition. The second is that some tasks performed by management personnel can be identified as a process or processes, but not all of them. The third view holds that management in a lean environment is not possible if management is not willing to subject its responsibilities and roles to the scrutiny of process orientation. This is necessary because a lean enterprise operates on the principle of reciprocal obligations; that is, *all* members of a lean enterprise have responsibilities and roles that they must fulfill, and all members of the firm have a right to assume others will fulfill their responsibilities and roles. The conclusion here is that the effort to standardize management processes in the lean environment must be undertaken by a committed management, even if it seems that the results will never be perfect. As the principle states, pursue perfection. The degree of process orientation in defining management in *each* firm is determined by the management of that firm, remembering that a process orientation to management is a requirement for efficient and effective lean transformation and lean operations.

Management in a lean enterprise is freer than management in a traditional organization because the more a firm operates as a set of integrated lean processes, the less a firm's activities require management intervention. The leaner the enterprise, the greater the scope of activities of employees and lower management. The leaner the enterprise, the greater the proportion of management activities that have been defined in process terms, resulting in more available time for nonprocess activities (as defined by each firm). The following are a few examples of managerial positions in the lean enterprise:

- Lean coordinator
- Process manager
- Cross-functional process manager
- Cross-enterprise process manager

Lean Coordinator

Generally, the follow-on position for a project manager is that of lean coordinator. Especially in the transitional period as the Lean Performance project becomes Lean Performance Management, the transition to lean processes gains momentum, and the rate and scope of change increases. The lean coordinator is designated when the steering committee begins to formalize Lean Performance Management as the project concludes.

Process Manager

Because the basic building block in a lean organization is the process, it follows that process managers need the skills of the process owner. By being well versed in value, value-added, flow, pull, and other lean principles, tools, and practices, managers can apply them in the processes that they own or manage.

Cross-Functional Process Manager

"Silo" management assumed functional specialization with functional interaction minimized. In a lean organization, cross-functional processes must be managed with a perspective of functional specialization coupled with a more multifunctional and organizational approach, with an eye on customer value. This is fostered by functional cooperation, not competition. The cross-functional process manager points the way by developing this dual perspective.

Cross-Enterprise Process Manager

Enterprise partnerships require functional specialization with inter- *and* intra-enterprise functional interaction. The position of cross-enterprise process manager requires a perspective of functional specialization coupled with a multifunctional and multiorganizational approach, with an eye on enterprise customer value. The activities of this position are fostered by functional cooperation, not competition. This is a very difficult dual perspective to foster.

These positions may already be formalized in your organization. They will emerge in any organization transforming into a lean enterprise. Lean Performance Management is the term given to the recognition that the project is ending, and these positions are emerging as a management structure in the lean enterprise.

Continuously Deploying Lean Policy and Strategy

Continuous deployment of lean business strategies developed as a result of monitoring and evaluating both internal process measurements and external developments in technologies and lean techniques is the primary activity of Lean Performance Management, and the responsibility of all Lean Performance managers. This is not a specialized position, because the relevant industry and organization knowledge is contained in the management team. Do not delegate this responsibility or add layers of specialized deployment specialists under the titles of *hoshin kanri*—catch ball or other diversions. The Lean Performance Analysis is a Western management tool. It services the need of policy deployment from a Western perspective. There is no need to duplicate it with outside "expert" policy deployers or other layers of MUDA. To implement continuous deployment of lean business strategies, we will execute a series of processes similar to the initial Lean Performance Planning module of the project:

- Identify Lean Business Policy
- Identify Lean Process Strategies
- Deploy Lean Policies and Strategies
- Perform the Lean Performance Analysis Continuously

Deployment of lean business strategies initiates continuous improvement on a *top-down* basis. It has three objectives. The first is to introduce into process management activities new lean techniques and technologies that may be useful to process owners to improve the value of their processes. The second is to ensure that Process Standards are being reviewed on a periodic basis to determine whether they can be improved. The third is to ensure that the search continues for new avenues to investigate for process applications through Lean Performance Analysis.

The Lean Performance project has increased the organization's responsiveness not only to customers but also to all relevant change and improvement opportunities. Learning how to get lean has been the focus, but now it is possible and necessary to consider new options. Because most changes so far have been small and incremental, they have not posed major problems. It is the cumulative and continuous impact of these changes that now presents the challenge to management. In most firms, at a minimum an annual business plan is comprehensively evaluated, reviewed, improved, and published. In Lean Performance Management, this business plan is evaluated, updated, and redeployed through identifying lean business policies and strategies and the deployment of Lean Performance Analysis masters. The information and other machine engineers deploy new technology opportunities to the process teams for process identification and application. Management expects and receives feedback from the process teams as they apply lean improvements. In the annual business evaluation, management examines how effective it has been in deploying the lean vision, lean mission, lean business policies, and lean strategies from the previous year. Individual policy deployment of Lean Performance Analysis masters are then initiated as the formal handoff from management to the organization for the year's Lean Performance analysis.

In this approach, management initiates the Lean Performance Analysis by deploying lean policy and strategy. Process managers respond with deployment at the process level, as in the project. At this point lean thinking has been integrated in the ongoing management process. There is also a mechanism providing for periodic evaluation of the lean opportunities available to the company because new resources, opportunities, and alternative growth paths become available all the time, and lean process improvements continuously free up resources with which to pursue them.

Although the journey to lean in an organization is never complete, there comes a time when being lean is the dominant orientation, value set, organization mode, and management style. There is a constant education, training, and development program in place for management, professionals, staff, and workforce. Although the Lean Performance project produces incremental process improvements, at some point ongoing process improvements do not require much management attention. At that point new challenges should be introduced—for example, moving to administrative processes.

Auditing Lean Performance

The project process has included extensive testing, beginning with the lean commerce team test of the customer critical data interfaces and extending through the pilot/prototype, process, and stress tests. The project team should be reasonably sure that it will have a successful cutover. In order to be absolutely sure that the live system is performing properly, project management should prepare now to conduct postimplementation Lean Performance audits 1 week, 6 weeks, and 12 weeks after processes are implemented, or until all audit criteria perform to expectation.

To conduct a Lean Performance audit, an outside reviewer can be utilized to review project performance with the project manager and the lean coordinator by looking at specific issues:

- User satisfaction
- Budget performance
- User understanding
- Schedule performance
- Open issue review
- Project objectives attained

In order to accomplish this, the reviewer will likely want to meet with each team. Team members will identify specific operating and system problems during the audit by exhibiting documentation and examples. The project manager or lean coordinator should be available to review issues with appropriate Lean Performance teams in order to prioritize problems for resolution and develop resolutions and corrective actions. The project manager or lean coordinator should present the audit results to the steering committee, or the Lean Performance Management team, for action in a discussion outline format. Any unresolved issues should be the lead items at the second and following reviews. Problem resolution results should also be covered and closed at the next audit.

Audits results can be measured by three criteria or by any variation that more adequately fits a given environment. The three criteria that we are proposing are:

- Survival
- Stability
- Improvement

An audit result of "survival status" means that the system and teams are able to perform the following:

- Recognize 100 percent of customer orders
- Obtain material to produce products
- Produce products

- Ship all products produced
- Fax or otherwise document shipments to customers (ASNs)
- Invoice all shipments accurately
- Audit shipments to invoice

When these items are satisfactory, the team can be reasonably sure that the new system and processes are having no adverse effect on the team's customers.

An audit result of "stability status" means that the system and teams are able to perform the following:

- Recognize 100 percent of customer orders
- Load customer orders into proper schedule weeks
- Report schedule information for customer shipment requirements
- Generate MRP demand planning data for materials
- Validate that material requirements are accurate
- Obtain material to produce products
- Report schedule information for final assembly requirements
- Produce products
- Ship all products produced to accurate order quantities
- Fax or otherwise document shipments to customers (ASNs)
- Invoice all shipments accurately
- Audit shipments to invoice
- Generate usable financial data

When these items are satisfactory, the team can be reasonably sure that the new system and processes are having no adverse effect on the team's customers. The system and processes are meeting the minimum customer requirements for shipments and data. The system is having no adverse effect on company operations.

An audit result of "improving status" means that the system and teams are able to perform the following:

- Load all eligible orders via EDI/XML/SOAP
- Recognize 100 percent of customer orders
- Load customer orders into proper schedule weeks
- Schedule requirements for customer shipments with system data
- Generate MRP demand planning data for materials
- Validate that material requirements are accurate
- Generate kanban tickets and cards for material replenishment
- Obtain material to produce products
- Schedule final assembly production
- Produce products
- Ship all products produced to accurate order quantities

- Ship all customer orders with accurate customer information, including labels, tags, and bar codes
- Report and document shipments to customer requirements using ASNs
- Invoice all shipments accurately
- Audit shipments to invoice
- Generate auditable financial data

When these items are satisfactory, the team can be reasonably sure that the new system and processes have no adverse effect on the team's customers. The team is meeting or exceeding customer requirements for shipments and data. The new system is having no adverse effect on team operations. The system will support efforts at continuous improvement.

Project Team Tasks

Completing the Implementation Readiness Assessments

After a review of the project plans for each implementation site, tasks remaining are identified and reported to the steering committee. Resource assignments are reviewed and adjusted. An Implementation Readiness Assessment is prepared for each site. Additional workplan tasks that are audited include establishing personnel requirements for the project team, identifying skill levels required to perform steps documented in the implementation workplan, monitoring work days required to complete each task of the implementation project, and monitoring target completion dates for each task. The project manager should also be sure that the installation of additional hardware is on track or completed. The entire team should prepare for cutover and start-up support. The materials and data accuracy teams should verify that the system is ready for MPS implementation based on item masters and BOM accuracy. Team members should finalize conversion plans and schedules and obtain steering committee authorization to cut over to new system and processes. After converting data, there should be a process for verifying data completeness and accuracy. All team members should monitor new system performance. The project manager should review all open issues in preparation for the first audit. See Figure 4.1 for an illustration of the kinds of issues and tasks that are often uncovered during Implementation Readiness Assessments.

Implementation Readiness Assessments are performed at important project milestones. The final audit is the basis of the go/no go decision. The implementation countdown begins with all remaining accepted items and the critical path defined.

COMPLETING IMPLEMENTATION READINESS ASSESSMENTS

IMPLEMENTATION READINESS ASSESSMENT
SITE: INTERNATIONAL

1 Process Ownership must be reconciled for several Financial and Engineering Processes between International Site and Corporate
2 The Bay routers were scheduled for delivery, but aren't here yet
3 The construction of the communication building is not complete.
4 Testing of communication lines reveals problems with supplier. Also, need to look at LDDS problems.
5 System default control account files submitted for review are not yet approved for implementation
6 New Standard Cost Process is ready to implement. Will finalize Workflow and Work Instructions prior to go-live

Figure 14.1 Implementation Readiness Assessment for International Site

Verifying System Integration

System integration is verified by completing a number of tasks, primarily involving the project manager, team leaders, and the information systems team. A checklist for systems integration verification should include:

- Identifying additional hardware needed
- Preparing a detailed hardware installation schedule
- Installing additional hardware for testing prior to implementation
- Verifying that the system is ready for go-live based on data accuracy
- Evaluating I/S personnel assignments
- Identifying manual tasks to run in parallel
- Finalizing conversion plans and schedules
- Finalizing cutover countdown
- Confirming any necessary tasks to be maintained in parallel
- Obtaining steering committee authorization

Counting Down to Implementation

Implementation countdown is the final extract of the project workplan (in other words, the tasks that are going to be completed before go-live). The countdown must include all necessary tasks for go-live, and the team must agree. All tasks must have resources available for on-time completion. Any task that appears on the final workplan that cannot be completed before go-live must be investigated, and the consequences and implications of that uncompleted task should be communicated far and wide within the company. No exceptions means no surprises.

Implementing Improved Processes

Improved processes are implemented by area, process, or product line, depending on Lean Performance Management structure adopted. Data is converted, and completeness and accuracy are verified. The new system is cutover. Team update meetings are held to identify problems and answer questions, and audits are performed. The information team is notified of technical problems via the open issue procedure. System performance is monitored. Open issues are reviewed with the steering committee, until the steering committee transitions into Lean Performance Management.

Providing Additional Training

To provide additional training, project management must evaluate personnel assignments and revise if necessary. There are often new hires, transfers, and stragglers who need to be rounded up and brought into the training cycle. Be sure to use process workflow and work instruction standards and real data to demonstrate new processes. Often, the last step to be included in training are the workaround tasks to be performed when the new system and processes go live. Identify any manual tasks to be maintained and determine who needs to be trained, and then do it.

Providing Production Start-Up Support

To provide production start-up support, in addition to auditing the system performance the project manager or lean coordinator should continue to identify and correct project system open issues and review and formalize month-end close processes by assisting in the initial month-end close.

Chapter 15

Continuously Improving Lean Performance Module

Project Team Tasks

Defining and Initiating Lean Performance Measurements

As we have seen, project objectives have driven project performance. Measurable business objectives drive Continuous Lean Performance, with concentrations in process quality, process cost, and process throughput and speed measurements. Team members incorporate the Lean Performance Analysis into deploying and reporting performance measurements. An example is provided as Figure 15.1.

There are three traditional reasons for measurements:

1. History
2. Baseline
3. Focus goal setting

- The first law of performance measurements is that all humans hate to be measured.
- The second law of performance measurements is that if I am going to be measured on something, I want to pick how the measurement works.

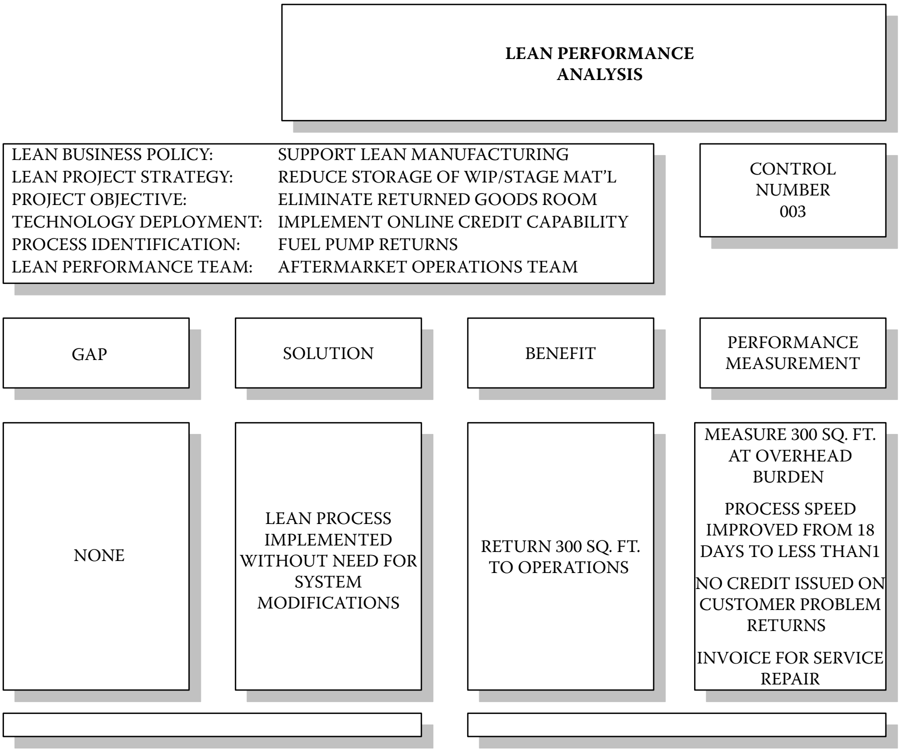

Figure 15.1 Lean Performance Analysis—Process Measurement Identified

- The third law of performance measurements is that when the measurement shows that I'm improving, especially if I get rewarded for improving, I like being measured.

The second corollary of the third law of performance measurements is:

- Performance measurements tend to be used to make the organization look good, not to help the organization look for ways in which to improve.

Although the current performance measurements utilized to manage the business are probably going to remain in place after the project concludes, if Lean Performance is going to avoid the usual self-serving but not very useful performance measurements, and also abide by the empowerment principles of the lean culture, principles for establishing new performance measurements are going to have to be established. I have proposed three principles for introducing new performance measurements:

- They must be process oriented or process based.

- They must be visual.
- They must be meaningful.

One important characteristic of processes is that measurements that are process-cycle or process-time focused tend to be more useful for continuous improvement efforts than are other measurements. Reducing cycle time is generally an indicator that other “measurable” items are improving. It usually means that nonvalue-added is decreasing and quality of output is increasing. In some cases it is an indicator that customer service is increasing, but sometimes it means the opposite. It usually means that batches and queues are shrinking. One other benefit is that it usually is easy to determine a measurement for cycle time. A Lean Performance measurements definition includes three types of measurements:

- Financial measurements
- Operational measurements
- Process measurements

A Lean Performance measurement definition should include a review of management decision processes such as business planning to verify traditional management measurements. These will tend to be financial performance measurements in most cases, such as financial performance to plan. They will also include traditional operations measurements, such as customer results reporting and performance to schedule. I am not suggesting eliminating these measurements, rather I am proposing only that any new performance measurements that are incorporated in the company management scheme adhere to the principles of process performance measurements illustrated above, concentrating on process throughput speed, throughput quality, and throughput cost. Other Lean Performance measurements are:

- Setup time
- Lead-time
- Cycle time
- Downtime
- Number of operators needed
- WIP #
- FG inventory
- Floor space needed
- Distance traveled per part
- Cost of rejects
- Equipment needed

Process workflows are the standards and the basis of process measurements, so it stands to reason that all improved processes are reviewed by Lean Performance teams for appropriate measurements. Standards, goals, data sources, and ownership

POLICY DEPLOYMENT AND MEASUREMENTS SUMMARY

GAP CONTROL#	LEAN BUSINESS POLICY	LEAN PROJECT STRATEGY	DEPLOYED PROJECT OBJECTIVE	TECHNOLOGY DEPLOYMENT	PROCESS DENTIFICATION	LEAN PERFORMANCE TEAM	PERFORMANCE MEASUREMENT
001	Support Lean Manufacturing	Reduce Manufacturing Lead Time	Implement 24 Hour Turnaround of Customer Orders	Use System Capability to Generates Pick/pack Lists Throughout the Day.	Customer Order Processing	Materials Team	Order Process Cycle Time
002	Support Lean Manufacturing	Reduce Manufacturing Inventory	Implement "Pull" Supplier Management Practices	Set the Item Master to Create Commodity Order Recommendations at Quantity/price Break Chosen	Vendor Order Management	Materials Team	Order to Price
003	Support Lean Manufacturing	Reduce Manufacturing Inventory	Eliminate Returned Goods Storeroom.	Utilize on-line Credit Capability of Software	Fuel Pump Returns	Aftermarket Operations Team	Return Process Cycle Time
004	Support Lean Manufacturing	Implement Flexibility for Low Volume Products	, Implement Manufacturing Line Sequencing	Utilize System Capability to Sequence Models and Variations within a Model on All Lines.	Injector Line Management	Injector Operations Team	Number of Line Break and Interrupts
005	Support Lean Manufacturing	Implement Flexibility for Low Volume Products	Implement multi-plant Sourcing of Finished Goods.	Implement Multi-Plant MPS Capability, Including Capacity Simulations	Advanced Production Placement	Materials Team	Production Expansion Quantity
006	Support Lean Manufacturing	Implement Flexibility for Low Volume Products	Implement EDI/ XML or Other E-Commerce Solution for Interplant Orders	Use Messaging Feature to Notify Placement of Multiplant Requirements Immediately	Advanced Production Placement	Materials Team	Advanced Production Placement Order Cycle Time
007	Support Lean Manufacturing	Implement Supplier Partnerships and Certification	Implement a Pay-on-receipt Process for Vendors	Allow Vendors Access Into Delivery and Schedule Screens to Manage JIT Deliveries	Vendor Order Management	Materials Team	% of Receipts Pay On Receipt In Period
008	Support Lean Manufacturing	Implement Activity Based Costing	Establish Product Target Costing/ MUDA Free Product Target Costs.	Establish Simulation Costing Database for Development of Additional Cost Data	Customer Order Quoting	Materials Team	Quoted Cost To Actual Cost Variation Per Period

Figure 15.2a Policy Deployment and Measurements Summary—Process Measurement Identified

POLICY DEPLOYMENT AND MEASUREMENTS SUMMARY							
GAP CONTROL#	LEAN BUSINESS POLICY	LEAN PROJECT STRATEGY	DEPLOYED PROJECT OBJECTIVE	TECHNOLOGY DEPLOYMENT	PROCESS IDENTIFICATION	LEAN PERFORMANCE TEAM	PERFORMANCE MEASUREMENT
009	Support Lean Manufacturing	Implement Process Integrated Document Tools	Implement Bar Coding for Plant Documents	System Can be Set up to Print Readable Part#'s on Orders and Pick Lists	Manufactruing Order Management	Operations Team	% of Ordes Processed with Bar Codes Per Period
010	Support Lean Manufacturing	Implement Process Integrated Bar Coding	Implement Bar Coding for Customer Requirements:	Use System Capability to Scan Confirm Shipment, Scan Shipping Charges, and Produce Labels	Customer Order Management	Materials Management	% of Ordes Processed with Bar Codes Per Period
011	Support Lean Thinking in the Global Standardization of Engineering Processes	Design and Utilize Concurrent Engineering Processes	Provide Access to Engineering Product Data at the Manufacturing Sites.	Use system Capability to Support on-line Real-time Access at all sites, at all Times	New Product Introduction	Engineering Team	New Product Introduction Process Cycle Time
012	Support Lean Thinking in the Global Standardization of Engineering Processes	Provide A Standard Software Format for Engineering Product Data Management	Implement a Standard Software Package for Engineering Product Data Management	Investigate 3rd Party and Interface Options Utilizing System Data for Item Master, BOM, Routing etc.	New Product Introduction	Engineering Team	New Product Introduction Process Cycle Time
013	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Central Cash Management	Determine and Accommodate Financial Requirements of Canada, Europe (EU, VAT), Asia.	Bolt-on 3rd Party Capability in Place for Project Use	Accounts Receivable	Finance Team	% Cash Available To Invest Over Total Receivables
014	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Central Cash Management	Include Currency Considerations	Can Utilize System Settings Configured to Example Attached.	Accounts Receivable	Finance Team	% Cash Converted Favorably Per Period
015	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Processing of Period Financial Closings	Consolidate Regional Financial Statements	Reports Should be Hard-coded to Utilize Data Available.	Financial Statement Reports Processing	Finance Team	Financial Statement Reports Processing Cycle Time
016	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Processing of Period Financial Closings	Consolidate global Financial Statements	Reports should be hard-coded to utilize data Available.	Financial Statement Reports Processing	Finance Team	Financial Statement Reports Processing Cycle Time

Figure 15.2b (Continued)

are also determined for each measurement. A performance report card, data collection sheets, and graph formats for steering committee and Lean Performance Management presentation are designed, or already existing.

Performance scorecards are utilized. Measurements are reviewed with Lean Performance Management and revised as required. A Lean Performance Analysis is performed on suggestions for improvement. Implementation of the Lean Performance measurement program is planned, and procedures are prepared.

POLICY DEPLOYMENT AND MEASUREMENTS SUMMARY							
GAP CONTROL#	LEAN BUSINESS POLICY	LEAN PROJECT STRATEGY	DEPLOYED PROJECT OBJECTIVE	TECHNOLOGY DEPLOYMENT	PROCESS IDENTIFICATION	LEAN PERFORMANCE TEAM	PERFORMANCE MEASUREMENT
017	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Develop Global Standard Reporting Formats.	Refer to Steering Committee for Design of Reports	Business Plan Performance Status	Finance Team	# of Non Standard Reports Issued
018	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Monitor, Evaluate and Report Product Line and Manufacturing Site Profitability.	Refer to Steering Committee for Design of Reports	Business Plan Performance Status	Finance Team	# of Non Standard Reports Issued
019	Support Lean Thinking in the Global Standardization of Financial Processes	Implement Centralized Integrated Data Support, Processing Monitoring the Business Plan	Develop Period-To-Date Reporting, Including Regional Sales, Margins and Trends.	Refer to Steering Committee for Design of Reports	Business Plan Performance Status	Finance Team	# of Non Standard Reports Issued
020	Support Lean Thinking In the Global Standardization of Information Systems Management	Implement Global Standard Hardware and Software	Implement Unmodified Software Packages	Modify Open Issue Approvals Only	Change Management Process	Information Team	% Modifications to Approvals
021	Support Lean Thinking In the Global Standardization of Information Systems Management	Implement Global Standard Hardware and Software	Leverage Vendor Supplied Software Upgrades	Maintain Simulation Database to Apply Upgrades and 3rd Party	Change Management Process	Information Team	Upgrade Response to Request Cycle Time
022	Support Lean Thinking In the Global Standardization of Information Systems Management	Implement Global Information Technology Processes and Organization	Implement Secure Data & Operations Processes in a System that is Seamless to the Users.	Utilize a Systems Management tool for all Operations Changes	Change Management Process	Information Team	# Of Incidents Verified Per Period
023	Support Lean Thinking In the Global Standardization of Information Systems Management	Implement Global Information Technology Processes and Organization	Implement Standards for Systems Uptime & Reliability & Measure & Report Performance	Identify all Data and Systems Operations Processes for Measurement	Systems Operations Processes	Information Team	# Of Incidents Verified Per Period
024							

Figure 15.2c (Continued)

After system cutover, initiate Lean Performance measurements by monitoring ongoing performance on data collection sheets and a Lean Performance report card. Present performance measurements to the Lean Performance Management committee each month and suggest action to be taken for improvement. Use a Lean Performance scorecard to identify the key process. Performance measurements are proposed by the disbanding Lean Performance project team. Establish a daily, weekly, monthly, quarterly, and yearly reporting scorecard or grid to prepare the measurements presentations.

Continuously Improving Lean Performance

Continuous improvement is not just for production processes. Continuous improvement is focused on the efforts of people to accomplish processes, not on the machines or computers that support them. As we have demonstrated in the project, continuous improvement is people based. People develop processes and are part of them. Improved processes improve results. Machines, including computers, are not processes. Discrete processes are not found inside the machine either. A computer does a data process just as another kind of machine does a grinding process. Machines, including computers, provide process support, and they may be process*ors* of machine processes, but they are not themselves processes.

Information and management decision Process Standards are the foundation for management and measurement of information/support and management decision processes and their continuous Lean Performance improvement.

Speaking about process performance measurements data regarding "office" processes, especially from a central database, confirms that management and supervisory work is not above process evaluation and improvement. Establishing, maintaining, and continually improving these processes is management's primary role in the computer-enabled process- and system-focused workplace.

Continuous improvement is not "just" a manufacturing/operations activity. The completions of both Lean Performance Planning and Lean Performance Improvement activities have documented the process workflow standards for management and office processes. Lean Performance is the management process that enables your organization to continuously improve all processes—management, decision, information/support, and physical.

Management's role in Lean Performance management is top-down leadership, including policy deployment, establishment of work standards (including process workflows and work instructions), and, most important, a demonstration of *active* support for Lean Performance, especially when the chips are down.

The roles of staff and supervisors in Lean Performance are to assist team members and solve problems. The team members do the work that creates the value.

The team member's role in Lean Performance is to be recognized as the process expert trained to recognize and eliminate nonvalue-added activities using Process Standards, measure processes, develop improvements, and communicate ideas cross-functionally and across the enterprise

In an unmodified implementation, process performance improvements are generally accomplished based on software capability. The new software has more capability than the software it replaced. The new software is being used more effectively because process owners and customers have applied that capability in a lean way.

By using the software in an unmodified form, as system users and process owners and customers become more familiar with the full features of the software they will derive additional benefit. However, there may be processes that are less efficient or effective now than when using the "old" software, because the old software had additional features that the new software lacks or because the old software had custom-programmed features or interfaces that the new software lacks.

Changing customer requirements are another reason for evaluating the performance of processes and considering improvement activities. Although some modification based on these realities may be necessary, the system as implemented should initially be "frozen as is" to ensure system stability during the start-up period. No additional modifications should be allowed to the production environment for at least 90 days following implementation approval date. Development will continue for modifications approved by the steering committee prior to the cutover approval date, according to a change management procedure, and programs testing. After appropriate testing, process changes should be implemented only when the system operations stabilize.

The purpose of the change management procedure is to manage changes to the software system. The change management procedure applies to three categories of changes:

- Fixes
- Enhancements
- Design improvements

Fixes are software changes that are necessary to provide data functionality as originally planned in the system design for a particular existing screen, report, or file update. Fixes include changes necessary to provide proper cursor movement, to provide consistent or standard cursor and keystroke mapping or functionality, and to provide proper error trapping and messaging. Fixes may also be needed to ensure that a key is used in a uniform manner throughout the system or to ensure that transactions update to design, and only update to design. All fixes must have issues written and submitted before they will be considered for assignment of resources. Unit tests for fixes will be performed prior to loading program changes live.

Enhancements are software changes that are necessary to provide additional functionality for data that already resides in the system, when this data is required to perform a necessary business process task, and the needed functionality is not present in the system as originally designed. Enhancements are limited to apply to existing screens, reports, and files or new screens and reports. Enhancements include changes necessary to provide for the viewing of data that already resides in the system, the updating of that data, or the reporting of that data. The category of enhancement applies to the need to view, update, or present data in the proper format, sequence, or time frame. All enhancements must have issues written and submitted before they will be considered for assignment of resources. Unit tests for enhancements will be performed prior to loading program changes live.

Design improvements are software changes that are desired to provide additional functionality for the purpose of improving the performance of a business process. This includes data that may or may not already reside in the system and any functionality that is not present in the system as originally designed. Design improvements are not limited to apply only to existing screens, reports, or files. Design improvements include changes necessary to provide for the viewing of data that already resides in the system, the updating of that data, or the reporting of that data. The category of design improvement also applies to any change desired to calculate, interface, upload, download, view, update, or present data in a new format, sequence, or time frame. All design improvements must have open issues written and submitted before they will be considered for assignment of resources. All design improvements should be developed through the formal design process, including the Process Standards (process workflows and work instructions), the conceptual, external, internal, and detail design specifications. It should go without saying that unit tests, volume tests, and process tests should be performed prior to loading program changes live.

In all of these cases, the process workflows are the tool for measuring and determining how a process, and the process input/output support, should be improved.

The six steps for continuously improving management decision and information/support processes, and their linkages to physical processes, are to:

1. Deploy management policy
2. Deploy information process technology
3. Identify processes and teams
4. Complete the Lean Performance Analysis
5. Build new information system supports
6. Complete updated Process Standards

Deploy Management Policy

The annual business plan now includes the identification and deployment of lean business policies and strategies. Any process team member can leverage the deployment by completing a Lean Performance Analysis master and distributing it for IT deployment, whether process and team are identified or not. This can also be initiated by any process team member to respond to a business policy or strategy deployed, for any process opportunity, be it a physical, information/support, or management decision process.

Deploy Information Process Technology

The deployment of information process technology initiates the response of the information technologists to the opportunity or need responded to by a process team member. This can also be initiated by an information technologist to respond to a deployed management policy or strategy. The process can also be used for any technology deployment, for any process opportunity, be it a physical, information/support, or management decision process.

Identify Processes and Teams

Process team members assume responsibility to attempt to utilize a technology deployed or seek a solution to a GAP they have identified.

Complete the Lean Performance Analysis

As we have seen in the project, new opportunities result from process expert input defined and communicated through the Lean Performance Analysis. Here is a summary checklist to follow in ongoing use of the Lean Performance analysis:

- Determine the adequacy and accuracy of the process workflow:
  - Does it adequately depict the process?
  - Does it accurately depict the input and output supports?
- When the process workflow is correct, demonstrate the compelling reason to proceed. Speak with data about process results, not with opinions.
- Confirm the understanding of process purpose with process owners and customers.
- Measure the current process results at a task level to determine current process results in cost measurements, quality measurements, and speed and delivery measurements.
- Check for the following:
  - Are there any nonvalue-added tasks?
  - Are they necessary?
  - Are there any unsupported tasks?
  - Are the input/output supports stable?
  - Is there missing information, data, or process support deficits?
  - Gather analysis results and utilize the 3 MUs and 5 Ws-1 H checklists to confirm.

Build New Information System Supports

Next, develop a new process workflow. Resequence tasks and process input/output support where necessary. Complete prototype layouts of new information systems screens and reports demonstrating field placement. Obtain process owner and customer approval of preliminary designs. Estimate measurements for process cost, quality, and speed or delivery at a task level. Be sure to simulate process execution wherever possible. Update process workflow standards and repeat demonstrations to process owners and customers. Achieve consensus that process performance is improved.

Program improvements. Do not intrude into the vendor source code. Pilot the results to reconfirm acceptance and measure results. Compare the new measurements with the baseline (before) measurements. Has the process been improved? Have all GAPs been closed? Repeat and refine until measurable improvement has been achieved. Finalize performance measurements. If no measurable improvement can be achieved, abandon effort. Do not alter the system for no benefit.

Complete Updated Process Standards

Refine the process workflows until they adequately and accurately depict the process tasks and input/output support. Complete process work instructions for any referenced screen or report in the process.

Continuously Improve Lean Performance

The lean transformation is never complete—it is a process, not a destination. From this point on there is a constant dual challenge for the Lean Performance Management team. It must work together with the process teams to maintain the progress mode, deploying advanced management policies on a regular basis and seeking new opportunities to further improve those processes improved in the Lean Performance project.

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Business Management

Lean Performance ERP Project Management

Implementing the Virtual Lean Enterprise

Second Edition

Brian J. Carroll

Lean thinking is too often narrowly focused on physical processes, causing serious shortcomings that limit Lean's substantial benefits. Revised to consider the emerging global economy, ***Lean Performance ERP Project Management, Second Edition*** integrates strategy, people, process, and information technology into a project management methodology that applies Lean thinking to all processes. It leverages Lean principles, tools, and practices to improve management decision processes, information/support processes, and their linkages to Lean physical processes.

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