



Integration of the Theory of Constraints and Lean Six Sigma

Guest was Bob Sproull

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The Ultimate Improvement Cycle: Maximizing Profits through the Integration of Lean, Six Sigma, and the Theory of Constraints shows you how to draw the best from Lean and Six Sigma by employing principles drawn from the Theory of Constraints. This approach will ensure that your effort is focused in the right place, at the right time, using the right tools, and the right amount of resources. This multi-pronged approach addresses cost accounting, variation, waste, and performance measurements. However, most importantly, it focuses your organization on the right areas to optimize.

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Joe Dager: Participating in the program today is Bob Sproull. Bob is an experienced manufacturing executive with a distinguished track record of achieving improvement goals in manufacturing, MRO, quality, product development, and engineering. He is also the recent author of 'The Ultimate Improvement Cycle,' a book about maximizing profits through the integration of Lean, Six Sigma and the Theory of Constraints. Bob, could you just start by giving an overview of what brought you to writing this book?

Bob Sproull: Sure. First, Joe thanks for having me on. I have enjoyed your podcasts for a long time, and I look forward to doing this one. So, what brought me into this? Well, that's a good question, and I promise you I'll try and give you a good answer. Like so many other people, so many other consultants or process engineers or whatever who had been using Lean or Six Sigma, or if you go back far enough, maybe, TQM. But, I found myself at the end of the day looking at the bottom line, and I wasn't really seeing a whole lot of movement in a positive direction.

So, what I decided to do is take a look at all the things that I had worked on, and those were both successful and unsuccessful projects. As you'll find out, I'm not a big believer in Lean and Six Sigma projects, but I'll get into that later. At any rate, I discovered that the ones that were successful, and successful meaning that we had good bottom line improvement that seemed to all flow through what we considered the bottleneck. Earlier in my career, I had read the goal, and I really hadn't made the connection between what was happening in the constraint and our bottom line. So, I

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was asked to take over a failing plant up in Kentucky. I mean, they were really failing; everything from the supplier base was terrible. The bottom line was terrible. I took over and in the first month we lost like 600,000 bucks, so I laid awake thinking, what am I going to do?

Then, I had my epiphany. I've got to get into what's being caught in the goal, and if I can focus in on the constraint and apply my improvement to the constraint through Lean and Six Sigma, I think I should see something hit the bottom line because I should improve throughput. Well, that's, in fact, what happened.

In a little less than two months, we had a million dollar turnaround on our bottom line, and I blame it all on this new methodology that's integration of Lean and Six Sigma and the Theory of Constraints. From that point on, I said, "This is it. This is the tool. This is the formula. This is my process of ongoing improvement."

So, that's really what got me into it, and I decided I had so many successes -I consulted for about 10 years for a company that specialized in the Toyota production system. And so, I leveraged that experience with what I had experienced in this plant, and wow, the results have just been pretty amazing. That's really why I got into it and why I wrote the book.

Joe: I have to compliment you on the book because it was an easy read. But as I read through it, I was bending pages over, and I knew I would have to come back to this. I'm going to have to do this. I'm going to have to look at this again. But, I did

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not want to break the flow of the reading. So many times when you get a book about a certain process, they go through the steps, and it gets monotonous, you really have to labor through it. But yours was an easy read.

Bob: I appreciate that.

Joe: I do have to compliment you on it. It wasn't a fiction story by any means. The highest compliment, I can give a book is if you end up on my dirty shelf where the books are all folded and marked up. Yours hasn't made it there, yet. It's still on the side of my desk here because I haven't marked it up enough. I'm sure it's headed in that direction. There is a question that I really have to ask you; why do we need all three? It seems mind-boggling. I don't have enough time to implement Lean. I have enough trouble implementing Six Sigma. Now, you throw Theory of Constraints on there. I think I'm headed for failure.

Bob: Well, Joe, I can tell you it is not the first time I've been asked that question. So, let me try and tell you actually why I think it's a whole lot easier using this integrated improvement method. In a typical Lean or Six Sigma or Lean Six Sigma implementation, one of the reasons why I think a lot of these efforts fail is because the organization ends up trying to do what I call "solve world hunger." In other words, they try and Lean out every aspect of the business. When, in fact, if you look at the business, every business has key leverage points.

So, my thought is rather than trying to improve every single aspect of the business,

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Let's focus on those leverage points, and those leverage points end up being what Goldratt referred to as the system constraints. One of the things that you have to be a believer in, and I know you're a believer in the Theory of Constraints, but one of the things you have to believe in is throughput accounting.

By that I mean, if you look at the components of how you make money in the business, you've got basically three things. You can go through an inventory reduction. The second thing is what most companies do is, they focus on reducing operating expenses, and, unfortunately, that typically comes in the form of layoffs, which I despise. The third component, though, is by increasing your revenue base.

So, if you look at those three components, when you reduce inventory, typically that's a one-time improvement in cash flow. If you look at operating expense -my definition of operating expense is any money that you spend to turn inventory into throughput. And you can cut operating expense way too low. You actually can debilitate the organization, and that's what happens to a lot of companies.

Throughput, on the other hand, and the definition of throughput in the Theory of Constraints world is new revenue entering the company, and that is really revenue minus total variable cost. That's such things as the cost of raw materials, sales commissions, those things that vary with the sale of a product.

So, the bottom line here is... Back to your original question, why is it so much easier? Well, you don't need nearly the army of improvement resources that you might think.

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I think another mistake a lot of companies make is they go out and train the masses and expect to see bottom line improvement. My belief is you need enough to focus on the constraint until you improve the constraint to the point where it's no longer a constraint. But, as soon as that happens, another one takes its place.

Then, you simply move your resources, your improvement resources, to that new constraint, and it becomes a cyclic cycle of improvement. It sustains itself. So, from that perspective to me it's a lot easier. All three initiatives, Lean, Six Sigma and the Theory of Constraints, not just complement each other, but they enhance each other. So, you get faster bottom line improvement with less effort. So, that's my take on it. That has worked for me in many of the companies that I have implemented this.

Joe: I'll buy that because I always heard that if you're not working on the constraint; your work won't be noticed.

Bob: That's pretty much-wasted effort.

Joe: Once that improves, of course, you're always looking forward to seeing where the next one's going to be, and I think you mentioned that in your book.

Bob: Yeah, we're prepared for that. We know what's coming down the road.

Joe: But then, how do you implement the Lean tools, or where does Lean play the role then? I have identified my constraint. I'm going to start working on it. Where's

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the Lean Six Sigma, come in?

Bob: OK, that's a good question, Joe. Here's my take on that. If you look at the primary purposes, if you were just considering a Lean implementation by itself, you're trying to do two basic things. And that is, reduce the inherent waste in the process, but you're also trying to improve the flow of the product. So, if you look at Six Sigma it too has its special focus, and that is primarily to reduce variation. I think Deming told us that public enemy number one is variation. You've got to reduce variation so that you have a more consistent process. So, what I do is once I have identified the constraint and by the way, I typically start an improvement effort by creating a value stream and process map so that it will help me identify where the constraint is.

Sometimes, it's not a physical constraint at all. In fact, most of the time, it's a policy constraint. But, once I've identified that constraint, and I simply reduce Lean to reduce waste and improve the flow and use Six Sigma to reduce variation, and if there are defects and so forth. So, it's really a straightforward process, and it really seems to work.

Joe: When I talk to the Theory of Constraints people, they say the Theory of Constraints is more of a culture and Lean is a set of tools and Six Sigma is a set of tools. You talk to the Lean people, and they say no, we're the culture. How about the culture of a company, do you try to implement kind of a culture when you did, let's say, the turnaround?

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Bob: Well, yes, the bottom line here is you've got to convince the leadership of the organization that what you're about to do is the right thing, but you can't just tell them. You've got to show them. You've got to make them be a part of it. If they're not committed, then it's not going to happen. If you stop and think about it, we have been running companies based on the cost accounting world for a long, long time. The presidents, vice presidents, CEOs have all been taught that you've got to use things like labor variances, efficiencies and so forth. One of the things that I talk about in the book is you've got to be willing to let go of that.

Now, you still have to keep the books because you've got to satisfy gap requirements, but the bottom line is if you want to make decisions that are going to improve the profitability of the plant, cost accounting is not going to give it to you. First of all, it's always late getting to you; it's a month old in a lot of places, but it's not what you need in your day-to-day decision-making.

Basically, I ask one question. It is What I'm about to do, going to improve the throughput of my process? If it isn't, then it doesn't sound like it's a good idea to do it.

Joe: One other thing in the book that struck me, really a little different, is that you talked about push and pull concepts.

Bob: There's a belief out there that if you start something sooner you'll finish it sooner. It's not true, not true. I'm a huge advocate of pull systems, and I just can't

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do business any other way. I think push systems have been around since mass production, and it just doesn't work anymore.

Joe: There're two other things that I noticed in the book. You put some basic formulas in there and describe them.

Bob: You mean about factory physics?

Joe: When you talk about a value stream and value stream mapping, the first thing you mention that you do in most situations is map the current process?

Bob: Yeah, you've got to know where you are before you can move to where you want to be. So, I do value stream maps and process maps. In the first step of this Ultimate Improvement Cycle, I also take a look at the performance metrics that is being used. I also then use the value stream map, process map to determine where the constraint is located. So that, to me, is an integral first step to finding out what our current reality is. This is the way our process is set up. It really helps you understand why or where you should focus your improvements.

Like I said before, I'm not a big believer in solving world hunger. There are leverage points within the process and, unless and until you capitalize on those leverage points until you focus on them, I just don't see real, lasting improvement.

Joe: How do you know when you find the constraints? How do you know that you're

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right?

Bob: It depends on the type of constraint it is. I went into a company that makes flexible fuel bladders for the aviation industry, and when I walked in there, there was inventory everywhere. I mean everywhere. If you looked at the process, the process is really simple how you make these. I'm going to simplify it even further for our discussion. Basically, you make a top and bottom of the tank. Then, you join the tank. Now, there are other process steps in there. But, those are the primary process steps. So, on one line, you're making the tops and parallel activity, you're making the bottoms. Then, you get to this joining operation.

Well, when I got there -first of all, they were all functional items, so we had to create itself, which we did. Then, improve the flow. But, the inventory backup in front of the joining operation was just incredible.

Just to give you an idea, it takes anywhere from one to three weeks to build the top and the bottom. Remember, they're done parallel. When you get to the joining operation, what I found in front of that joining operation was 84 weeks worth of tops and bottoms.

Now, imagine if you had a quality issue, and you didn't know it. My goodness, it happened over a year ago.

But, what I said and finally, after many discussions convinced the Vice President of Operations to let me actually run the one line. He reluctantly agreed. So, the very

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first thing I did, you can probably imagine, I shut down the front end of the process where they were pushing tops and bottoms to the joining operation, and I cross trained everybody in the work cells.

I asked the question, "Why would they continue to run and build inventory in front of this constraint?" So, that's when I found -remember, one of the first things was asking the question, "What are the performance metrics?" Lo and behold, it was operator efficiency. They were trying to drive operator efficiency as high as they could.

So, in every step in the process, they have the operators working as fast as they can to build as much just so they could artificially improve their overall efficiency at the expense of profitability. So, we threw that performance metric out the window and only used it in the constraint, in this case, the joining operation. So, what actually happened is they had been running around 83 percent efficiency. The efficiency actually dropped from around 83 to around 70 percent. But, the profits went from negative 50 grand to plus 200 grand.

So, that's why I use the value stream map and the process map and decide on what the metrics are in place because it all tells a story. That's how you find the constraint. In this case, the constraint was not really the joining operation. It was the policy constraint using the performance efficiency metric.

Joe: Most of your constraint guys will come in, and they'll say, "We can cut your inventory in half."

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Bob: One of the major benefits of cutting your inventory is you actually reduce cycle time. So, that's really the primary reason. Of course, you get a positive hit on your cash flow. But, the big thing is that you will get a reduction in your cycle time, which translates into better on time delivery. That's the one thing you'll find if you go into a company that's got lots of inventory. You can bet that on time delivery is poor, and that was the case in this tank company.

Joe: I've always been amazed that the more inventories you had the worst deliveries you had.

Bob: Yeah. You had the wrong inventory anyway.

Joe: It always camouflages what is going on. In bad times, you find out the people those running truly a good company because cash is king and the cash tightens up, and if you still have throughput, you're still fine. But, the problem people have is when inventory starts backing up, their cash starts disappearing. They're in trouble.

Bob: Yep! You got it.

Joe: The Theory of Constraints is such a great principle. Why do you think it's not really, hasn't ever been on par with Lean and Six Sigma?

Bob: You know, Joe, I have always given that a lot of thought. In order to really buy

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into The Theory of Constraints, you've got to give up some principles that you've learned along the way. Not the least of which is, I keep going down to the cost accounting world, that's the reality. I truly believe that it's at odds with, The Theory of Constraints is at odds with, cost accounting -traditional cost accounting. And I think if you look at who runs the company. In many cases, it's the CFO that's making all these decisions because cost accounting says, "This is what we should do." So, I think that's one of the primary reasons why Theory of Constraints really hasn't been as accepted. I believe that this integration is really going to turn out be the definitive improvement cycle going forward. I just believe that with all my heart. That's my take on why.

Joe: I've always wondered, and I can see that when you say that because Lean addresses waste right away and cost accounting is the champion of that. Let's get rid of the waste. The first thing that happens with Lean is Five S, and everybody knows what Five S is, and Muda is and sometimes they'll Five S the heck out of everything for two years.

Bob: That's right. You're right, though.

Joe: And Sigma side, the project always has to be a certain size because Six Sigma takes a certain amount of resources to make it work. To make a successful Six Sigma project, you're always worried about the size because you have to dedicate resources to do a project like that.

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The thing I wanted to touch on that I found, again, very interesting about your book is that you devoted the last part of it to the logic tree and the logical thinking that Goldratt uses. I read it, and you probably made much sense to me about how to utilize it and how to build the trees than I've seen in Dettmer's or Goldratt's books. Maybe it was just the practical side of it because you put it in a context that I understand.

Bob: But, if you give it to me in real life terms, then I have a much better chance of understanding it. What I tried to do there was show how you could use things like the current reality tree, the evaporating cloud, the future reality tree and so forth. What I didn't want the book to be a lesson on how to do those. By the same token, I had to actually work through an example, a simple example I'll say, too, by the way, just to see how you could use it.

The bottom line here is, as you know, you read *The Goal* many times I'm sure, the goal of every company is to make money now and in the future. But, it also includes other things that other take place. We have to have happy customers. We have to have happy employees.

You've got to be able to satisfy those just as much as making money. What the current reality tree does in its most simplistic form is there are all kinds of negative symptoms that you see within a company, Goldratt calls the undesirable effects.

And the whole logic is, typically, there are only one or maybe two group causes for all

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the undesirable effects. And that's what the reality tree does is it ties all those undesirable effects into a nice neat package. Then, you're able to determine what the root cause is, and it works so well, so well. The example in my book is about as simplistic as you're going to get. But, I'm a simple guy.

Joe: You would use that over, let's say, a fishbone diagram to find the root cause and the five why's.

Bob: Remember the scope of what you're trying to do with a current reality tree, you're looking at what are the things that are affecting me strategically. I use things like causal change and fish bones for specific problems I'm going after. But, when I know that I have a global problem, a total system problem, and those things I just don't think you can get to where you need to be. So, that's why I use the logic trees as we call them. That's exactly what they are for.

So, it's not that I prefer them; it's just that I think the level that you're trying to sell requires a tool other than a fish bone, or causal chain, or whatever.

Joe: There's only just a pretty small group of people in the world when you sit there and talk about a UDE. I don't know if anybody would know what talking about. I'll have to admit that's one of the areas I struggled with is truly understanding the thinking process that he's developed.

Bob, is there anything else you would like to add here?

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Bob: There are some very important points, I think, that can be taken away from, not just from a book, but any of Goldratt's books or really an improvement in general. One of the things that I think is missing in a lot of companies is placing problem-solving, and we need to change. Companies that side with a main static to me are companies that are just going to not be here next year, next month or whatever. But, the problem is I don't think people spend enough time learning key techniques in problem-solving. That includes both the strategic problem solving like we just talked about and also problems that occur on an everyday basis.

I think another important message is I think people need to move away from trying to optimize locally. That is, for example, in the example I gave on efficiency. They were trying to push the efficiency numbers higher and higher, and all they ended up doing is creating inventory because they were focused on a local optimization when you really need system optimization.

That's one of the other messages that comes through loud and clear with The Theory of Constraints. You've got to focus on how I am going to improve the system, rather than just pieces of it.

I think one thing, as I said I consulted for like ten years and so many times I went into a company and they talked about how they involved their workforce, when in reality, if you really were wanting to involve your workforce and get the sustained improvements that you need, you've got to recognize that the people on the shop

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floor are your experts. They're the ones that can lead you to new and better processes. They're just full of improvement ideas. But, you've got to listen, and you've got to let them lead you down the improvement path. That's probably about it.

The other message is this stuff isn't hard. I promise. When I went into this company I'm working with now, they were just shocked and surprised at how easy it is to learn and apply this improvement trilogy, if you will, the integration links, Six Sigma, and the Theory of Constraints. So, it's not hard. Don't be scared. It works.

Joe: I thoroughly enjoyed your book and talking to you. How can someone get a hold of you? Now, that your book is available, of course, on Amazon.

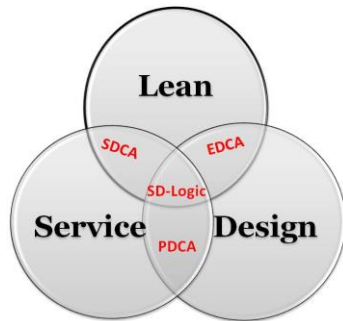
Bob: They can go to my website, and that's www.sproullconsulting.com. My contact information is on there.

Joe: If anybody would like to download this, it will be on Business901 iTunes store or the Business901 website site.

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Joe Dager is President of Business901, a firm specializing in bringing the continuous improvement process to the sales and marketing arena. He takes his process thinking of over thirty years in marketing within a wide variety of industries and applies it through Lean Marketing and Lean Service Design.

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