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TURNING VISION INTO REALITY.

# Lean and Flow Manufacturing

Why do businesses exist? Although there are many reasons why they are started, their status as going concerns is maintained by their ROI – return on investment. ROI is influenced not just by profitability, but also by investment tied up in assets, such as inventory. And in many ways, the absolute value of ROI is not as important as what's being done to constantly improve it. What does ROI have to do with lean and flow manufacturing?

Everything. Think of some ways in which a company's ROI can be improved:

- Add valued features and products – and convert the value to price and volume
- Leverage that increased volume; eliminate costs that don't add value
- Improve quality to minimize rework/scrap/warranty exposure
- Change the mix in favor of high-margin offerings

And that's just on the P&L side. There are endless improvements to be made on the balance sheet as well, which usually revolve around initiatives that:

- Reduce inventory – or other assets – while achieving high service levels
- Bring in the cash from A/R well before you have to send it out against A/P

Fascinating. But what do these things have to do with lean and flow manufacturing?

Every segment of a business – production, design, and support organizations – has customers and products. Every business segment has an impact – favorable or not – on ROI. Lean and flow manufacturing – let's call it Lean/Flow, since its techniques apply to any business segment – both creates and enhances the segment's valued features and products. Lean/Flow establishes the potential for leveraging increased volume. It identifies and highlights activities that don't add value and/or compromise quality. It drives flexibility, to minimize the volatile impact that mix can have on profitability. And the more advanced Lean/Flow techniques optimize the segment's assets and liabilities, by acknowledging variability and world-class service levels.

So how does Lean/Flow achieve all these lofty goals? We'll look at each of the claims we just listed, to see how; and we'll use a manufacturing environment, as needed, for an example. Keep in mind how the example applies to your products, processes and business environment:

**Lean/Flow Creates Valued Features and Products**

Product 1 – Shorter Response Time: Will your customers pay more for quicker response? Will quicker response garner more customers, more volume, and more market share? Call it a separate product, or call it a feature of your current products – response time is valuable. And shorter response time is a direct result of Lean/Flow.

Lean/Flow defines, or flowcharts, the relationship of processes – work that is done to convert raw materials into the customer's product. Then, three techniques are applied:

1. Lean/Flow attempts to physically arrange the production facility so that it looks like the flowchart. Reasonably, a facility that looks like a flowchart should FLOW toward the shipping dock.

2. Lean/Flow balances work, ensuring that each process in the flowchart has sufficient resources to output a product at up to a customer-defined maximum frequency. What does that mean? Say our customers may want 400 products per day. And we want to work only one shift, or about 400 minutes, per day. Obviously, each of our processes must have adequate resources – people and/or machines –

to ensure that it can output up to one product per minute. But we must also have balance: Let's say that our product is made sequentially, and we can assign each of us a portion of that sequential work. What would happen if just one of us were given, say, 2 minutes' worth of work? The whole facility would be slowed to that pace, and we wouldn't satisfy our customers. In our imaginary sequential production line, it is critical to ensure that no one has more than one minute of work: balance.

3. Lean/Flow utilizes simple, instant, clear signals to communicate customer demand to every person and machine. Say Joe does the first minute of work on our product, and Sue does the second minute's worth. Say Joe completes his work on a product, and Sue does not take that product from him right away. Joe has just received a simple, instant clear signal from his customer Sue: NO DEMAND. When Sue takes Joe's completed unit, the empty space where the unit used to be is a simple, instant, clear demand signal to Joe: MAKE ONE MORE.

Those three Lean/Flow techniques – physical proximity, balanced work and clear demand signals – ensure that once a product starts, it does not sit, or queue. Lean/Flow creates a product response time that is equal to, or even less than, its total work time.

Product 2 – Consistent Response Time: The same techniques that brought about shorter response time, once formalized and established, result in predictable and reliable response time consistency.

**Lean/Flow Leverages Increased Volume Off of Existing Resources**

Refer to the three basic Lean/Flow techniques outlined above: flowchart facility layout, balanced work and clear demand signals. When those techniques are applied, the facility and its resources are more productive. Often times dramatically so: A braze-and-assembly facility in Colorado found that when it implemented these three techniques, it could consistently output TWICE the volume it used to – with the same resources and factory floor footprint that it already had; without overtime. And it was a good thing. An unexpected market upturn drove that line at its doubled volume for months on end.

**Lean/Flow Identifies and Highlights Activities That Do Not Add Value and/or Compromise Quality**

Refer again to the second Lean/Flow technique described above: balance work. In order to balance work, you must know three things: 1) what tasks make up that work, 2) what order are those tasks performed in, and 3) how long it takes to do those tasks.

Documentation of those three things is at the heart of virtually every Quality audit initiative. And, of course, adherence to that documentation is what brings about quality.

Lean/Flow adds three more tools to this documentation. Here are those three tools, and how they identify and highlight waste work and/or quality exposure:

1. Assign to each task an identifier: Waste, or Value. Would we advertise that task in a trade journal? "Buy our product because we…." If we would, then that task is a value task. For example, buy our product "because we assemble Part A to Part B, we know you don't want to do that, and we know you'll pay us a premium to do it."

   Say the ad read, "Because we move our partially assembled product 3,000 yards from one building to the next, since we didn't lay out our facility the way we should have." No doubt about it, that move is a required task. But we clearly identify it – in our official, definitive documentation – as Waste. And that waste task is 'in our face' until we eliminate its root cause. When we have addressed it, we update our documentation and that Waste goes away.

2. Answer this question about each task: "How do we know we did the task correctly?" Take, for example, some kind of light assembly. Let's say our product is 24-color crayon packs. Sounds easy enough, but almost every task can be done incorrectly. There's only one right way to fold up the tabs on the box.

Nothing prevents us from putting a crayon in upside-down. We can easily envision the potential for leaving a color out, putting two of the same color in, or putting less than 24 in a box.

Of course, there are many things we could do to make it easier for our crayon-pack assemblers to build each pack correctly. In fact, our assemblers used to ask for those improvements. But they gave up out of frustration, and we now assume that there are no quality problems in our crayon packs.

Imagine, though, our official, definitive production documentation. In addition to "Waste or Value," we have also 'in our face' the quality exposure described against each task of work. And that exposure confronts us until we eliminate its root cause.

By the way, our documentation of how long it takes to perform a task must represent how long it takes to check and double-check the quality exposures. And since check/double-check takes time, we must ask this question about the time: Would we advertise it in a trade journal? A soul-searching question, as our conscience may answer with, "Buy our product because it is poorly designed and uses incapable processes that force us to look at every little step twice before we ship it to you."

But let's not get defensive! After all, our customers may tacitly or explicitly expect us to do those checks and double-checks; in essence, they pay us for them. If our product was a commercial air flight instead of a crayon pack, we wouldn't even need to advertise: "Take our flight, because our pilot and co-pilot go through their whole pre-flight checklist every time; and we charge the cost of that back to you." Air carriers that don't do that also don't have customers.

Likely, we catch the point: Lean/Flow drives us to take a hard, honest look at work, quality and value. That's a worthwhile effort all by itself.

3. Check and double-check each quality-exposure task. We have already identified each task with quality exposure. And we determined which crayon-pack assembler does which tasks when we balanced work. Now, each crayon-pack assembler will answer, "how do I know I did the task correctly" – every time he performs that task. Not at the end of the line, but at the point where the task is performed. And to ensure quality, crayon-pack assembler Sue will double-check the same tasks Joe just performed and checked – before Sue does any more tasks to that pack.

   Our Lean/Flow work instruction documentation can now be applied to each unit, with established techniques for graphically representing work and quality, and using proven assurance techniques such as touch-for-quality.

**Lean/Flow Enhances Flexibility, and Minimizes the Profit Impact of Mix Volatility**

When we implemented the three basic Lean/Flow techniques – flowchart facility layout, balanced work and clear demand signals – we assumed a mix and volume. After all, we also make 12-pack, 72-pack, non-permanent, Spanish, Italian…. We then set up a facility with a capacity driven by that assumption. We went to all this trouble in order to take care of our customers. Every day. We knew we'd maximize our ROI if we always pleased our customers. Of course, never will we see the day when our customers' mix and volume are exactly what we assumed they would be. On the other hand, we'll lower our ROI if we build our assumed mix and volume every day – mix and volume that our customer doesn't want every day. Fortunately, when we laid out our facility, we used our flowchart approach to look for process commonality.

When we analyzed our total daily demand for crayons, we found that it was remarkably steady. Yes, there was a dramatic seasonality pattern, but that was predictable and we knew how to accommodate it. And when we compared our flowchart for the Spanish-language 12-pack to the non-permanent Urdu-language 72 pack, we saw that most of the processes were the same. Certainly, the materials were different. And sometimes, the work time was different. But we saw the potential for a multi-product crayon-pack assembly line. That line would be staffed by flexible crayon-pack assemblers, able to make any product that the customer wanted. Any day. And that would be a real benefit, because non-seasonal daily demand was very steady in total.

Now we had very few processes that were dedicated to a specific product. Most were common to the total volume, which meant that their costs could be spread across that total volume. Low-volume, high-unit-cost products that had been produced on their own lines now benefited from mass-production savings.

Our profit volatility due to mix was now mainly driven by market factors, as it should be; and not by product cost.

**Lean/Flow Optimizes Asset and Liability Levels**

The unavoidable result of Lean/Flow's shorter lead-time is lower inventory. As we discussed earlier, once a product is started in the "flow" line, it stays in for no more than its total work time. It is work in process inventory for only that short time. Prior to having implemented Lean/Flow, the product, or its subassemblies, would have queued – likely for more time than it was worked on – and the queue time would have added dramatically to work in process inventory. There is a direct correlation between lead-time reduction and work in process inventory reduction.

Lean/Flow lead-time reductions also directly impact finished goods inventory levels. Let's say our customers typically place their orders with us one week before they expect shipment. If our Lean/Flow lead-time is less than one week, we may not carry any finished goods. And if we build, say, railroad locomotives that take more than one week to build even in a flow line, we may carry finished goods inventory to cover only the difference between our flow line lead time and the one-week demand visibility lead time.

Notably absent in our Lean/Flow discussion thus far has been the Lean/Flow approach to raw materials. However, raw materials are the foundation of any product, their steady availability in the face of varying demand mix and volume is vital to customer satisfaction, and their optimization is critical to a company's financial performance. So, we will now look at how Lean/Flow techniques ensure both materials availability and optimal asset utilization.

First, let's consider the physical points at which a Lean/Flow production line may need to have raw materials:

1. At the line itself. As you recall, when we balanced our line, we defined specific tasks and the exact line location at which they occur. This means we also know exactly where on the line any raw materials component is consumed. For that component, we need now to answer:
    - How often do I want to bring more of this component to this location on the line? The frequency at which I do this will determine how many pieces of that component are at that location, how much space that component takes up, how much cash is tied up for that component, and how much it costs, over time, to handle that component

2. Nearby the line. In order to ensure that a component is always available for the line, and acknowledging that we can place only so much of a component at the line, we'll put more of that component at a location that's convenient for replenishing the line on a timely basis – like a component supermarket for the line. In determining the supermarket location(s) and footprint(s), we'll need to answer a question similar to that for materials at the line itself:
    - How often do I want to bring more of this component to this supermarket location? The frequency at which I do this will determine how many pieces of that component are at that location, how much space that component takes up, how much cash is tied up for that component, and how much it costs, over time, to handle that component

3. In a raw materials warehouse. Many factors drive companies to carry warehouse inventories of components, including:
    - Unpredictable and/or long supplier lead times
    - Unpredictable component usage, including scrap
    - Unpredictable incoming quality acceptance percentages
    - Inaccurate inventory-system perpetual balances

This list of factors can easily be expanded, yet a couple of words will always show up: Unpredictable or inaccurate – in other words, variation. Of course, various initiatives that dovetail effectively with Lean/Flow, such as Six Sigma, address variation. Companies are constantly faced with prioritizing which variation to attack first. Whether the variations listed above can be immediately addressed or not, Lean/Flow techniques accommodate whatever variation exists.

Next, let's use a familiar example to consider how five Lean/Flow techniques ensure timely acquisition of raw materials components:

1. Replace consumption
2. Safety stock
3. Sufficient resources – people – to replace consumption
4. Optimize the frequency of replacement
5. Known previous consumption is better than forecast future consumption

1. Imagine getting that first cup of coffee in the morning. Caffeine – the raw materials that you turn into a productive day! So, rinsed-out mug in hand, you approach the carafe, and (of course) it's empty. There is no clearer signal that more raw materials are needed! And why is the carafe empty? Because its contents had already been consumed by your early-bird workmates. This example illustrates what signals a Lean/Flow business to acquire raw materials components: Replace consumption.

2. The trouble with that empty carafe is that you were going to get that first cup of coffee on your way to a morning meeting. That meeting starts now, and you have no coffee. When the carafe is empty, it takes time to fill it up again – lead-time. You and your customer – the meeting that is now going to start late because of the coffee lead time – are suffering from a "parts shortage." What's the solution? As far as you are concerned, your immediate problem could be resolved by having more than one carafe at the coffee station – a safety stock, so to speak. This example illustrates how to protect the materials available for consumption: Safety stock.

3. That extra carafe worked out well for you. But sooner or later it will be empty, just like the first one. All we accomplished by having two carafes was to delay the inevitable lead-time to fill up at least one of them. Eventually, someone must take the time to fill up a carafe – but whose job is it? Well, it could be you, and everyone else who takes coffee from that station. But you would have to allow, and be allowed, time for the possibility of having to fill up the carafe if you emptied it. Or, it could be someone's assigned responsibility to check for an empty carafe on a regular basis. The point of the illustration is that someone must have the responsibility and the time to replace consumption.

4. Sometimes, that first cup of coffee in the morning tastes stale, burnt, and maybe even cold. Why? Because it was left over from the day before. And why did that happen? Because a freshly filled carafe may last several hours. In fact, even coffee made the same day may not taste good, because it is several hours old. The solution in this case is to increase the frequency at which the coffee is made. Get a coffee maker with smaller carafes. Of course, the opposite problem may exist instead: The carafes are always empty, because everybody refills there and the carafes are too small. If the carafes are too large, we always have too much coffee on hand, and some of it would be no good. If the carafes are too small, we spend too much time refilling the carafes, and too little time doing our job. The point of this illustration? The quantity held by the signal optimizes the frequency of replenishment.

5. Might it not be easier to try and forecast how much coffee will be drunk today, and make it all up at the start of the day? Since office coffee never tastes good anyway, let's say that freshness was not an issue. Still, it isn't hard to imagine that virtually every day, our forecast was too high – coffee and money were wasted; or our forecast was too low – we wasted time, and the money associated with time, making more coffee. This illustration shows that replenishment that is driven by what we do know – previous consumption – is much more reliable than replenishment driven by what we don't know: how much we will consume today.

This is not to say that there is no value in a forecast. At some point, when we bought the coffee makers, we had to forecast how many and how big. Not just sufficient for today's coffee drinkers, but for a forecast in employee headcount growth. In fact, our forecast had to include seasonality: More coffee is consumed on a cold winter day than on a hot summer day. More coffee is consumed in the first three hours of the day than in the last six. With enough data, we could confidently ascertain both growth and seasonality. But the problem with a daily coffee forecast is neither growth nor seasonality. It is the remaining component of variability: irregular variation. By definition, its timing cannot be predicted. So it's no wonder that our daily coffee forecast doesn't work very well. The benefit of the Lean/Flow technique – replace consumption – is that it is perfectly suited to address the irregular variation that cannot be forecast at a point in time.

Six main factors influence the application of Lean/Flow techniques to any given raw materials component.

1. The customer-lead-time expectations of our products
2. Each raw materials component's replenishment lead time
3. Each component's usage variability
4. Each component's contribution to overall product cost
5. The capability of the company's perpetual-inventory system
6. Each component's optimal replenishment frequency

Let's examine each of these in further detail:

1. The customer-lead-time expectations of our products: If our products are commodities, our customers allow us very little lead-time. If we don't have their product immediately available, they'll call our competitor. On the other end of the spectrum, our products could be highly configurable, and our customers may place orders well in advance of when they require shipment.

   In the first example – the commodity – we may have to carry significant finished goods, even with our dramatically reduced Lean/Flow production lead-time. The customer won't wait for us to build his product, and he certainly won't wait for us to order and receive the components we need to build his product. So we must carry a level of component inventory, to take care of orders we haven't even seen yet.

   The second example – the custom product – may command a long customer lead-time. Especially with our Lean/Flow production lead time improvements, we may be able to wait until we have a customer order in hand before we make his product. In fact, we may be able to wait until we have the customer's order before we acquire the components required to make his product.

   If our market allows us the luxury of acquiring raw materials based on a customer order, the last five factors listed above are moot. This enviable situation actually exists in a few industries. But what if we're among the envious many, not the envied few, and we must carry raw materials in anticipation of customer orders? Then our goal is to achieve a high level of customer service, while optimizing the financial performance of the inventory required to hit that service level. Factors 2 through 6 allow us to quantify the optimal Lean/Flow inventory level of any component.

2. Each raw materials component's replenishment lead-time: Some components may have lead times short enough to allow us to wait for a customer order before we acquire these components. But what of those components for which this is not the case?

   A fundamental Lean/Flow tool, kanban, allows us to acquire inventory based on previous consumption. In a previous example, the empty coffee carafe was a kanban – a signal to get more. The other carafe contained at least enough coffee to last during the lead-time for refilling the empty carafe. If it takes a long time to refill that empty carafe, the other carafe will need to hold a lot of coffee. If the empty carafe can be refilled quickly, the other carafe can be smaller. In any case, once we know a component's replenishment lead time, we know how much needs to be available while we wait for more.

3. Each component's usage variability: On average, our much-maligned coffee carafe lasts about one hour. But sometimes, it goes empty in 10 minutes. Other times, of course, it may not need to be refilled for three hours. The trouble is, we cannot predict how long any given carafe-full will last. If we could, we would call it seasonality; and we might accommodate it in some way. But if we cannot predict usage during a specific period of time, we are experiencing the effects of irregular variation.

   Irregular variation is by definition unpredictable. However, it is also quantifiable. Historical usage variation can be analyzed statistically to determine standard deviation, which is a measure of variability. Of course, unpredictability indicates that we will be dealing in probabilities, or odds. Don't worry, it's legal. And Lean/Flow will use the quantifiable nature of irregular variation to swing the odds in our favor.

   A coin toss is very simple example of irregular variation. On any given flip, we don't know if it will be "heads" or "tails." Yet, intuition tells us that we have a 50-50 chance of getting "heads" on any given flip, without even needing to do any math. If we determine that we need to get "heads," how many flips are required to 100% fully guarantee our desired result? Each additional flip increases the likelihood that one of the flips will have been "heads," but we never quite get to 100% likelihood. After five flips, we can be about 98.4% sure that one of the five will have provided our desired results. Double that to 10 flips, and our confidence goes up to about 99.9%.

   If time was important to us, and we couldn't take the time to do 10 flips, we could instead figure out a way to flip 10 coins at once. And we could be 99.9% confident of getting the desired result in one mass flip. And so it is with components – and we thought we had gone completely off the subject. We don't know how long a specific carafe of coffee will last, or how long 500 "burnt sienna" crayons will last, or any other materials that we may need. But we can quantify the usage variation of those materials. And we can put enough of those materials in place – like flipping 10 coins at once – to achieve a world-class confidence level.

   Obviously, this means we must invest in more inventory. Keep in mind that we are making this investment to cover variation that does not have predictable timing. And remember, too, that if we don't make the investment, it may cause us to miss a sale. The fact is we use many techniques today – many of them subjective and of dubious value – in an attempt to cover variation. Lean/Flow quantifies that variation, and applies it to the kanban methods described above.

4. Each component's contribution to overall product cost: The "80/20" convention says that most of a product's cost is represented by a small group of components. The high-cost components merit much attention, since they can easily tie up cash and eat up profits unnecessarily. Add to that the variability discussion above, and it sounds like the high-cost components will financially eat us alive!

   Early on in our discussion of Lean/Flow, we determined that response has value in our customers' eyes. Hand in hand with response is service level. In other words, not only can we respond quicker, we can always respond quicker. Why? Because we have materials available. And we must convert that service level to profits: Perhaps our service level differentiates us from our competition. Perhaps our volume goes up because we no longer lose sales due to poor delivery performance.

   Using Lean/Flow kanban and variation techniques, we will still optimize our inventory investment in light of a strategically determined service level. The accuracy of the kanban and variation calculations, the frequency at which the calculations are revisited, minimizing what is on hand while maximizing what is on order, reducing or eliminating order minimums and multiples – all these will be employed in our pursuit of getting a good and always-improving return on our inventory investment.

   Of course, the 80/20 convention also tells us that we won't have to put so much effort into most of our components. For the vast majority of our components, the simplicity of Lean/Flow kanban will require very infrequent review, no statistical analysis, and the advantages of package sizes and order multiples.

5. The capability of the company's perpetual-inventory system: Back to the trusty coffee carafe! In fact, let's say that we work at a large company, and there are very many coffee carafes at very many stations throughout our facility. Coffee replenishment has become a significant task, and we have hired Bob, a specialist who does only that.

   Bob cannot keep an eye on all carafes at once – though someone, somewhere is constantly fussing at him about coffee shortages – so he proposes an electronic solution to his dilemma: Every time Bob makes coffee, he uses a handy keypad to transact the coffee made. And, every time someone gets coffee, that person uses the handy keypad to transact the coffee used. Bob carries a portable, wireless terminal that constantly feeds him on-line, real-time perpetual coffee inventory status. The pluses – when he makes coffee – and the minuses – when you and I get coffee – electronically emulate the simple empty-carafe method that worked so well when there weren't so many coffee stations.

   See any problems with Bob's system? Absolutely! Entering a transaction on the keypad, no matter how handy it is, is not exactly a natural part of getting a cup of coffee. It's not even very natural for Bob to do a transaction after he makes coffee – though he has more compelling motivation to do so than do you and I. And what about variability in what constitutes a "cup" of coffee? Or spillage? Do we transact our coffee usage by weight, instead of by "cup?" Do we outlaw personal mugs, and provide only official containers? Do we exchange the carafe for a computer-controlled "shot?" Or perhaps install a device that senses how much is still left in the carafe when it is replaced on the burner.

   These problems are not insurmountable. The key is discipline: Always do the transactions. Always do it accurately. Always do it right away. And, of course, make the transaction as convenient, error-proof and natural as possible. When the discipline is in place, and the perpetual-inventory system is capable, then everyone – whether Bob, you or I – benefits from an electronic management technique that emulates the visual empty-carafe kanban signal.

   If the discipline cannot be quickly instilled, and if Bob's gee-whiz coffee-inventory system is not capable, then Bob will soon discard his electronic method and go back to a more cumbersome – but always reliable – inventory management technique: visual kanban.

6. Each component's optimal replenishment frequency: Obviously, the smaller the carafe, the less coffee is on hand – so long as the carafe isn't so small that it's just empty most of the time. Less is good, but none is bad. If coffee represented a major expenditure in our business, we might minimize the cash tied up in coffee by using smaller carafes.

   Shortly after we went to smaller carafes, Bob began to get very stressed. He was coming in early, and staying late, because the smaller carafes meant more frequent refills for him. So our company now had to weigh the savings from carrying less coffee against the overtime and other costs of more frequent refills.

   The point of this now thoroughly overused metaphor? Replenishment frequency strikes a financial break-even between asset carrying cost savings – or asset utilization improvement targets – and increased asset acquisition costs. The potential for carrying cost savings is greater on the relatively small number of high-cost materials means they can be profitably replenished more frequently. In contrast, frequent replenishment of the majority of components – the low-cost materials – will generate more acquisition costs than carrying-cost savings.

   Lean/Flow's kanban techniques can accommodate the right replenishment frequency for any component. It achieves this regardless of the component's lead-time, usage variability and service level. And it does this in response to something we clearly know – what we have consumed – instead of an unsure forecast.

**Lean/Flow and Legacy Systems**

We have now considered how Lean/Flow ensures customer satisfaction by providing people, machines, skills, flexibility, quality and materials. Does it require some new, special system to support it? Probably not.

Most existing management systems, such as MRP, are capable. Most have been in existence for decades, and have very few bugs. Many MRP systems, for example, can do detailed resource calculations – MRP II – like we outlined above. They include perpetual inventory balances, safety stocks (the "second carafe"), order multiples (how big is the "carafe" kanban) and future gross requirements features. Many companies have an established documentation system defining work, the order in which it is done, and requisite quality.

Why isn't everyone "doing" Lean/Flow, if the systems that support it already exist? Three reasons:

1. Failure to utilize the capability of the existing systems. Name a company that completed its implementation of MRP. Name a business that doesn't scramble, in advance of an ISO audit, to look like it always follows its own documentation.

2. Utilizing system features that introduce more complexity and variation. MRP, for example, is solidly linked to a forecast. The forecast cannot accommodate irregular variation, so MRP provides a plethora of other parameters in an attempt to cover that variation. The forecast completely disconnects replenishment from consumption, so MRP provides impressive and complex netting logic. Solid in theory, sound on paper, but with so many variables and inputs – all with a cumulative error potential – that the results are unpredictable and unreliable.

3. Failure to commit, in terms of written business objectives, procedures and policies, to the original reasons for implementing those systems. Name a company that has not been rightfully accused of being a member of the "book of the month" club. Name an organization that has not seen very successful programs that fail as soon as the champions are assigned to another project.

By the way, does it sound like there is a love-hate relationship between Lean/Flow and MRP? There is not. MRP, materials resource planning, is critical – we must have materials in order to take care of our customer, and we won't have those materials if we don't plan them. Even the forecasting that is at the heart of MRP is vital – our suppliers and we must have an idea of how our future mix and volume will impact our materials needs. Really, Lean/Flow and MRP are solid partners, so long as consumption – not forecast – is driving replenishment.

**Lean/Flow and Your Business**

Do not despair! Just because it is hard to name a company with commitment and discipline doesn't mean none exist. They do. It doesn't mean your company cannot change – all businesses change.

Lean/Flow experts, REAL Lean/Flow experts, can help your business with much more than just the mechanics, calculations, floor layouts and other tactical steps. You can get those from a book – although in doing so, you will find all the many painful and costly pitfalls that a Lean/Flow expert will steer you clear of. Lean/Flow is no different than any other initiative, in that it will succeed where there is commitment and discipline. That sounds like a platitude, but it is not: Real Lean/Flow experts provide a powerful "white coat syndrome" while your company is developing its commitment and discipline habits. And real Lean/Flow experts can also show your company how to formally obligate itself to Lean/Flow as a self-perpetuating way of life.

To learn more about how Lean/Flow can benefit your company contact FlowVision, LLC at 970.262.6536 or via email at *info@flowvision.com*.