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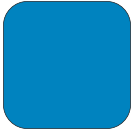
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THE CONVERGENCE OF LEAN AND

This is a first step to bridge the methodology gap that exist between the practitioners of lean and standard costing

STANDARD COST ACCOUNTING

GARY KAPANOWSKI

The Beatles' 1969 hit, "Come Together," said it best: "I know you, you know me, one thing I can tell you is you got to be free; come together, right now, over me."¹ While there are many publications that highlight the differences between lean and standard cost accounting, whether through defining each methodology or describing the specific tasks performed, there are not many that explore the areas where lean and standard costing come together to achieve an organization's goals and improve decision-making.

The focus of this article is to show that the convergence of lean and standard costing is to be more than believed. Instead of focusing on the differences that divide the cost management community, this article will focus on ways to bring the accounting community together. Over time, the accounting community will find new ways to work together to develop synergies for the advancement of accounting practices and improved decision-making. As with lean's focus

on the customer and respect for people, it is the tenant for lean professionals to unify the process for efficiency and effectiveness, bring the process under control, and allow everyone to work in the best environment possible to complete their tasks. This is our call to arms: Start the conversation on what can be done together to develop the best accounting practices and decision-making processes.

This article will start with sharing the classic views of lean and standard cost accounting to set our baseline understanding. The lean definition and identification of *muda*, or waste, is then presented to illustrate how lean and standard costing can be utilized together, which will be expanded into the 14 principles of lean based on the Toyota Production System (TPS).

Lean accounting

In lean accounting, direct costs are identified through the value stream of the process to improve flow and eliminate waste.² Lean accumulates all of the direct

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costs charged to the process flow then divides by the number of items shipped from the process to find an average product cost. Cost includes payroll, material, and facility costs; however, overhead is not applied to the product cost. The emphasis here is on speed and quality over cost. Also, lean doesn't assume full capacity but rather a marginal incremental approach for decision-making.

Lean attempts to optimize flow to meet customer demand and eliminate waste. Metrics used include throughput, cycle time, first-time quality, and inventory turns. Lean routings are simple as most go through the same process or common routing due to the emphasis on value stream mapping. To maximize flow, the sequencing of product flow is kept close to allow for the flow to pass quickly, typically in days, to achieve low inventories. Thus, lean does not treat inventory as an asset.

Lean accounting has an aspect of contribution margin analysis that is familiar to all accountants. This simple and easy approach allows for company-wide understanding of good business decision-making. Other features used to manage business include identifying what makes the cash flow increase in the value stream and what bottlenecks are preventing unused capacity from being used to produce product.

Standard cost accounting

Standard cost is the efficient utilization of machinery and people to provide the lowest average product cost.³

Under efficient operations, standard cost represents the process

in control. Best used in mass production, standard cost places emphasis on economies of scale to drive lower costs. Standard cost assumes full capacity and full absorption of costs. In a standard cost routing, each product will have its own routing, which may place it anywhere on the plant floor. Cost is the accumulation of all individual routings. This process moves slowly, typically weeks to months,

creating high levels of inventory. Thus, inventory is treated as an asset.

Metrics used for monitoring and control involve both cost and volume variances to validate if the manufacturing process is operating according to plan, validating appropriate allocation of overhead, and ensuring cost per part is realized. Metrics used in standard costing include labor efficiency, machine utilization, and cost variance. Therefore, in a standard cost environment, our goal is to make the most product as possible, build inventory, optimize our resources and department efficiencies, track labor, and allocate other costs. Due to the emphasis on cost, standard costing is considered contrary to lean.

The convergence of lean and standard cost accounting

Both approaches have a common goal to reduce any variance. In lean, this is called waste reduction. In standard costing, this is used for operational effectiveness. To bring each closer together, reviewing variances as a weekly or daily standard routine will produce quicker results for improvement, provide a timelier review and better understanding of the variance than at month's end, when the variance occurred more than 30 days ago, and sustain continuous improvement activities. This is a lean approach to a standard cost practice.

Continuing the variance discussion, variance is waste. Without variances, the process is considered in control. In lean, this is the state needed for implementing improvement within the process. With this in mind, standard costing uses lean principles for improvement.

The marginal approach for decision-making is common in every make-buy analysis for all accounting methodologies. With this understood, many applications for lean are utilized in standard costing measures, such as make-buy analysis and contribution margin analysis. Several types of contribution margin analyses include reviewing profitability of production without indirect cost and reviewing direct versus indirect costing. This common analysis indi-

LEAN ATTEMPTS TO OPTIMIZE FLOW TO MEET CUSTOMER DEMAND AND ELIMINATE WASTE.

EXHIBIT 1 Eight Wastes: The Real-life Obstacles Preventing an Organization from Profitability

1. Transportation	Unnecessary movement of material or product
2. Inventory	Material or product that is used to cover for inefficiencies
3. Motion	Unnecessary movement of people; multiple hand-offs
4. Waiting	Elapsed time between processes when no work is being performed
5. Overproduction	Producing in excess of customer requirements; service not needed
6. Overprocessing	Adding unnecessary steps to a process; redundancies between processes
7. Defect	Anything that does not meet the accepted customer requirements
8. Resources	Demotivating the workforce by not asking for input or recognizing success

icates another focus area for the methodologies to unify best practices.

Many have argued against full absorption costing. When full absorption costing was developed in the 1900s, labor represented about 60 percent of the costs; today it ranges from 5 to 15 percent.⁴ This difference in the application of indirect cost has changed the landscape of product costing. The 45 percent divergence of cost requires some method of overhead absorption. Since no application will replicate the true cost for the manufactured part, the increase in overhead to be applied will misrepresent cost more so than in the past. Both methodologies can agree that overhead application can distort cost and that reducing the overhead impact is beneficial for everyone.

Lean definition

One of the first approaches to finding waste is to evaluate the culture of an organization or society. An easy way to view this is through the “lens of lean” and understanding the lean definition. Lean is the identification, elimination, and reduction of waste or non-value added activities within a process as perceived by the customer.⁵ Lean has two concepts that make it completely different from other process improvement mythologies: respect for people and continuous improvement to eliminate process wastes with the knowledge that nothing is perfect. In Jim Womack’s book, *Lean Thinking*, he describes

this thought process as “a way to do more and more with less and less” to provide customers with what they want or are willing to buy.⁶ The intention of lean is not to starve a process into control, but to enhance the process to be in control, or to be effective and efficient.

In the lean review of processes, ask these questions to complete a lean assessment (you can substitute environment or culture for a macro view of lean):

- Is the process efficient, effective, and in control?
- Was there a time when the process was in control? If so, what’s changed?
- Are there any variances? If so, how many and how large?
- Is this process customer focused throughout?
- Is the environment promoting or using continuous improvement techniques and are they sustaining this process?
- Does the process have respect for the people in the process?
- Does the process allow the operators to make adjustments for improvement?
- Does the process overburden one group over another based on difficulty, risk, or time?

When you have a lean process, things move quickly as if they are done without thinking, completed automatically by the process operator. When everyone looks at the sun, they agree the color is yellow,

EXHIBIT 2 Toyota Production System (TPS) 14 Principles of Lean – 4P Model: The Industry Lean Standard

1P: Philosophy: Long-term Philosophy (1)

1. Long-term Focus *Hoshin kanri* - long-term meet short-term goals

2P: Process: The Right Process Will Produce the Right Results (2–8)

2. Create Flow Bring issues to the surface
3. Pull Produce only what is needed to avoid overproduction
4. Leveling *Heijunka* - balance out demand
5. Do It Right *Jidoka* - quality right the first time - stop, fix, do it right
6. Standardize Build improvement philosophy to ensure continuous improvement
7. Visual Control Do not hide anything
8. Technology Rely on proven technology to serve the people and process

3P: People and Partners: Add Value to the Organization by Developing Your People and Partners (9–11)

9. Leadership Grow your own leaders and embrace the TPS
10. Teams Develop people and teams who follow the TPS
11. Help Others Extend lean to partners and suppliers, respect

4P: Problem Solving: Continuously Solving Root Problems Drives Organizational Learning (12–14)

12. See for Yourself *Gemba Walk* - go and see yourself to understand the situation
13. Decision-making *Nemawashi* - make decisions slow, implement fast
14. Reflection *Hansei* - reflect and kaizen – continuously improve

*Adapted from Liker, J.K., *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer* (McGraw-Hill, 2004).

without question or hesitation. Your heart beats without you knowing or doing anything. In sports, the players say they are “in the zone,” everything works as planned and without fail. Another way to view this is through the telephone game.⁷ With each process (or person) connected sequentially, a word is spoken to the first process and then repeated throughout the chain until the information stops at the end of the process (i.e., the customer). In our lean analogy, the word will not change, and the process will become faster and faster for continuous improvement without defect.

This is good practice to recognize when a process is in a lean state and when it's not. When the process is not lean, you will be able to identify waste or *muda* (see Exhibit 1).⁸ It is important to identify the type of waste encountered to properly eliminate it from the

process. By eliminating waste, we provide the customer a product or service with more value by continuously improving to satisfy the customer, and allow respect for the process operator so that they can complete their process efficiently and effectively without problems preventing them from performing their task, which allows for process improvement.

In any costing system, everyone can participate in understanding lean by using their “lean lens” or “lean eyes” to identify when the process is not lean, and, when observed, to select the type of waste to be eliminated. This type of waste elimination task is for all employees to undertake in any costing system. With an estimated 90 percent of all processes containing waste, it should be easy to find.⁹ Thus, all organizations can implement lean to reduce costs.

EXHIBIT 3 Five Steps of Lean: Understand the Overall View of Implementing Lean in an Organization

1. Identify value
2. Identify value stream
3. Flow
4. Pull
5. Perfection

TPS: 14 principles of lean

The next lean aspect to consider is the 14 principles of lean based on the TPS (see Exhibit 2). I have found this is a great way of identifying the organization's lean culture and maturity scale for waste (or variance) reduction. Each principle will identify how well the organization is implementing, sustaining, and growing lean throughout each process. I have used this 14-principle model as a lean Balanced Scorecard with the eight wastes to identify this aspect of lean maturity for variance reduction.¹⁰ This article will discuss several of these principles to find commonality within both costing methodologies.

TPS 1: Long-term focus

Both lean and standard costing have, in some aspect, a tool used to understand the process. In standard costing, the router for operations provides the process flow. In lean, a value stream map is needed to view the process and metrics to locate waste, understand the production process, and indicate any unused capacity that can be used for growth.¹¹

Value stream mapping and standard cost can be combined to assist with understanding the production process. By utilizing standard cost for hours and dollars, we can populate the value stream map to determine the waste incorporated within the process. This will identify the value-added and non-value added activities, place a cost on these activities, and calculate waste (or variance) within the process. This is sometimes called the cost of poor quality in the current state. With the company forecast, this cost can be extended to reach an annualized value

for waste reduction and capacity utilization to identify growth opportunities. Another aspect of waste is the difference between planned and actual cost. This is identified when the actual value for cost is either better or worse than planned. This will alert management to possible adjustments that need to be made to meet the projected financial metrics for the organization's goals and objectives. Any large variance is waste in this process due to the work needed to adjust. Other uses for value stream mapping with standard costing include eliminating non-value added activities in the operations router, assisting with product costing for the bill of materials and routing, and using target costing to assist with quoting new work.

TPS 2: Create flow

The basic theory behind standard cost is that it allows for mass production to achieve economies of scale at a reduced cost per part. Continuous flow behaves similarly with an additional aspect of meeting customer demand, noted as takt time, to prevent waste such as inventory, defect, and wait time. As an example, the mass production of the Henry Ford Model-T vehicle simulated a fast-paced, one-piece continuous flow due to a single product type without experiencing changeover time. His term for this was "flow production," the birthplace of lean.¹² As the product mix increased, the problem of flow was experienced in the production line changeover, causing a loss of time and production flow. Lean's flow focus assisted early lean leaders like Taiichi Ohno to greatly reduce changeover time, reduce cost of unnecessary equipment and related space, and improve quality for a reduction in cost.¹³ By creating continuous flow, problems are brought to the surface to be resolved. With this focus, continuous flow can be effective for production with high variety, market volatility, and short product lives.

Basing the takt time to equal the customer demand will provide equilibrium for the process. Any variance at this level will indicate divergence from the con-

tinuous flow causing waste. This includes the standard cost variances of volume and cost. Volume will indicate the waste level of inventory experienced to either underproduce for customer demand, resulting in missed sales, or exceed production of customer demand, creating excess inventory. Thus, we can use the standing costing system to visualize if we are meeting our customer demand, improving quality, and continuously improving. As we accomplish these measures, the standard costing detail will adjust. This includes documenting the new process, updating standard work, then implementing *kaizen* to make the change official and implement the new process throughout the organization. Thus, standard cost using the current level of activity can be used as a gauge to measure for waste (variance) and improvement.

TPS 3: Pull

The next step in lean is to understand the basic five steps of the lean process (see Exhibit 3). In lean, every activity in a process is identified as either delivering or not delivering value to the customer. The goal is to eliminate, when possible, the non-value added activities. After this is completed, the activities are sequenced into the process and combined to form a value stream. Each value stream will then indicate how it flows from the customer order to the customer shipment based on time metrics.¹⁴ The flow will then be put into action as the customer indicates they want the product or service, generating a pull demand to start the process to satisfy the customer demand. As the organization completes each customer demand pull, they look to perfect the process by eliminating waste as previously described. This is a continuous cycle of activity.

In either lean or a standard costing system, this process might slightly differ in overall execution, but both will still perform every step, and both will require the activities performed to add value to the customer. The flow toward delivering the product or performing the service must be as planned and without waste. Each will also look to perfect

the process to satisfy customer demand, improve quality, and reduce cost. The execution of each might be slightly different due to the manufacturing process of either pull (make to order) or push (make to stock). I contend that standard costing can be used in a modified pull scenario as long as the customer is at the source of the demand and the production and standards are based on customer demand. This can be a difficult concept to utilize in a standard costing model, but it is expected to have different standard costs for the same product if the product is produced in different value streams based on high or low volume. This can be experienced when cell manufacturing the same part but in different cells based on the customer.

TPS 4: Leveling

One of the lean concepts that is hard to resolve is the idea of one-piece flow in a continuous flow with high product variety or mix. The concept of *heijunka*, or level production and scheduling, is used as an alternative to the start-stop approach of batch production. The goal is to smooth production. In this scenario, reducing batch sizes to equate with customer demand will improve customer relations and remove excess inventory or waste. There are many illustrations for this in manufacturing, but the main idea is to reduce the setup time to allow for balanced production. An illustration of smoothing production is to take the different products and organize them to make a continuous production flow of all products. In the production flow of product A and product B, the production smoothing is represented as A-B-A-B-A-B.¹⁵ As we can see, production smoothing can be incorporated into any methodology to reduce the risk of unsold goods, decrease inventory, and balance the use of resources to be more effective and efficient.

TPS 5: Do it right

One of the main concepts of lean is understanding the value proposition of quality. For lean, quality is built into

AS WE CAN SEE, PRODUCTION SMOOTHING CAN BE INCORPORATED INTO ANY METHODOLOGY TO REDUCE THE RISK OF UNSOLD GOODS, DECREASE INVENTORY, AND BALANCE THE USE OF RESOURCES TO BE MORE EFFECTIVE AND EFFICIENT.



THE DIFFERENCE FROM LEAN TO STANDARD COST IS THAT LEAN RECOGNIZES THE CURRENT CUSTOMER DEMAND AND MAKES TO THAT SCHEDULE, WHILE STANDARD COST SEEKS TO PRODUCE TO A VOLUME THAT MAY OR MAY NOT REFLECT THE CURRENT CUSTOMER DEMAND, OFTEN PRODUCING EXCESS INVENTORY.

the process and culture. Some of the examples include using quality assurance methods, detecting problems by machines and people, including support systems to quickly solve problems and implement countermeasures (asking five whys), and allowing for stopping or slowing the production to get quality right the first time to enhance productivity in the long run (i.e., an *andon* system). This includes stopping the mentality of “move the metal.”¹⁶

In either methodology, eliminating waste will reduce cost and provide higher profit. Eliminating rework of production, essentially completing a product twice to ship to a customer, is waste along with the space and inventory needed to complete the rework. In many comparisons, lean production has 67 percent fewer defects than mass production as well as higher productivity.¹⁷ This formed the phrase in lean production that “quality is free.”

For both methodologies, fixing quality issues at the point of occurrence is beneficial to the organization. This reduces rework, inventory, and space utilization. Implementing an *andon* system to stop production to eliminate any additional rework in the system will reduce costs. Implementing problem-solving teams using root cause solutions like the five whys (i.e., asking the why question five times to determine the root cause of a problem) will prevent the problem from recurring.

Another way to visualize quality issues is to implement the rolled throughput yield metric. This is a great metric to show how production is working or not working toward our customer demand. The difference from lean to standard cost is that lean recognizes the current customer demand and makes to that schedule, while standard cost seeks to produce to a volume that may or may not reflect the current customer demand, often producing excess inventory. To assess quality, the rolled throughput yield will determine how much waste is produced in the process.

For each operation, the standard for defect (nonconformance) is known. For

production level quality, each of these operations convert the defect level into a percentage of conforming production, such as 99.5 percent production. To obtain the rolled throughput yield, we simply multiply all the percentages from each operation together to obtain a single percentage yield. This percentage tells us how many parts travel through the production process without defect (nonconformance). The hidden plant is now exposed and can be calculated based on the cost for rework or scrap needed to make the part conform to the customer specifications.

This cost is usually buried within overhead as an indirect cost and not reviewed. By implementing rolled throughput yield, this cost can be easily seen, managed, and corrected. For any accounting methodology, correcting for defect, scrap, rework, warranty, etc., will not only improve the bottom line for the organization’s costs but also allow for growth as we free up resources such as people and machine time to make more parts instead of fixing already produced parts.

Due to the nature of defects, rolled throughput yield will also indicate bottlenecks in the process due to the overall flow of product not being in agreement with the standard of defect, indicating issues in production to identify the defect, causing a loss of productivity. The improved business decision occurs due to the identification of inefficiency in machine usage of producing good parts and underutilized capacity that can be used for growth.

TPS 6: Standardize

Taiichi Ohno indicated that standards are required for lean production to work, and “without standards there can be no *kaizen*” or improvement.¹⁸ This is a strong statement by one of the original lean leaders establishing that standards are the foundation for continuous improvement. Fortunately, the most common aspect of each costing methodology is the use of standards. Both use standards to identify the current state of costing and work instructions. When there is a change to

the standards, this is reflected in the variance and updated in the costing or process flow, representing continuous improvement.

Standard cost applies a planned value for all products based on labor, material, and overhead. To impose continuous improvement, utilizing improvement *kata* and coaching *kata* will assist with this process. Improvement *kata* is the review of the current condition against a target condition for improvement and changing one variable at a time.¹⁹ Using standard cost as the target condition, we can track our approach for improvement, reducing high variance. This review of the data can be performed daily, weekly, monthly, or yearly and can be used by both methodologies for improvement.

TPS 7: Visualizing

In any methodology, the control and monitoring aspect is needed to understand if the process is working as expected, and when it is not working as expected, where to adjust. One way to understand the process is to visualize the activity. This is accomplished through control charts with the takt time as the standard or average to be achieved. Utilizing upper and lower control limits can determine if the process is in control or lean. Anything outside of the control limits is waste. Thus, this visually identifies activities in normal and abnormal conditions. Since the chart indicates the level of activity by date, we can identify the times when this occurred to understand and fix the issue. This is another method of identifying the hidden plant or waste not easily seen.

Another visual process is the 5S method. The process of establishing value and non-value in a process or workplace is essential for any variance reduction program. The 5S program can be brought in to complete this action. In any process, 5S starts by sorting the process for value-added and non-value added activities (*seiri*), setting the value-added activities in order (*seiton*), shining or having the value-added activities

in the best possible condition (*seiso*), standardizing the value-added activities for all to understand and use (*seiketsu*), and finally sustaining the activity to continually remove non-value added activities or variance from the process (*shitsuke*).²⁰ As we can see, this process can benefit any methodology for variance reduction.

TPS 8: Technology

Although automation is viewed as an improvement to productivity, new technology can be unreliable and difficult to standardize. It is often best to work out a process manually before adding technology to support the process.²¹ This starts through small increments of capacity, installing in-process sequences, such as cellular layouts, and keeping them as simple as possible. The goal is to minimize the throughput time for the whole sequence of production steps while maximizing machine capability and availability (called stability) as opposed to machine utilization. Workers are typically more flexible than machines, so automation is only considered if necessary. Seeking improvement through technology is not discouraged, but the entire process must benefit before that path is utilized. Since 1990, production manufacturers have not seen advancements in automation for component and final assembly.²² For either methodology, consider the entire flow of the change to technology before installing, which includes testing and validating the improvement of flow. There is a great quote by Eiji Toyoda regarding the use of technology: “We must remember that in the end it is the individual human being who must solve the problems.”²³

Conclusion

This is a first step to bridge the methodology gap that exist between the practitioners of lean and standard costing. A future article will complete the TPS review of the two methodologies using principles 9 through 14. The goal of this article is to show commonality between the lean and standard costing method-



THE PROCESS OF ESTABLISHING VALUE AND NON-VALUE IN A PROCESS OR WORKPLACE IS ESSENTIAL FOR ANY VARIANCE REDUCTION PROGRAM.

ologies and not continue the divergence of the cost accounting community. We can accomplish more by working together than separately. Let's come together over the opportunity for improving management accounting. ■

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¹⁶*Op. Cit.* note 12, p. 55.

¹⁷*Op. Cit.* note 12, p. 83.

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²³*Op. Cit.* note 21, p. 159.