

The Possibility of Misinterpreting Improvements in the Value Added Ratio - Christopher J. Bujak and Raphael L. Vitalo, Ph.D.

Problem

The value added ratio (VAR) measures the percentage of a process's cycle time that is expended in adding value to its output.¹ The remainder of the time expended is, by definition, waste. On its face, an improvement in the value added ratio indicates that a process cycle is more *value efficient*. But that judgment would be misleading. The value added ratio only measures the value efficiency of *time expended as a product traverses a process's critical path*. Only the activities on the process's critical path determine the interval between products exiting a process.² VAR does not evaluate the total amount of activity time a process consumes nor the total resources it uses. It also does not evaluate the worth, from a customer's perspective, of what the process produces (the real value of the output). A judgment of the value efficiency of a process would require a different ratio, one that related the worth of the process's output as judged from the customers' perspective to the dollar value of the resources the process consumes.

This clarification of the VAR's meaning reveals a potential problem in its use as a measure of improvement—specifically, what its significance is for deciding how well a business is implementing lean commerce at the operations level. On its face, it would seem that the VAR's significance is straightforward. The higher the VAR the better a business is implementing the dictates of lean commerce at the operations level. But, as you will see, that is not always the case. In fact, it is possible to improve a process's VAR yet harm operations' contributions to realizing lean's purpose.³

How VAR Improvement May Detract From Accomplishing Lean's Purpose

Almost always, improvements in a process's VAR are constrained by the requirement that the improvements made be either cost neutral or cost reducing. However, this is not always the case. Hence, the following scenario is theoretically possible. In the pursuit of improving VAR, a *process cycle* may be made to have a greater ratio of value adding activity, as reflected in its VAR, while not actually removing waste at all. For example, one might take a waste activity (e.g., searching for a tool) and divide it among multiple people who pursue in parallel, each searching a different possible location. Although unlikely to occur—such a solution might well reduce the amount of *cycle time* wasted in search and result in an improved VAR. The solution would, of course, add cost and be reflected in the unit cost of each process output whose value content would *not* have increased. Also, search time would not have been eliminated if one added all the time expended by the people doing search and not simply the search time reflected on its critical path. Further, if we evaluated the modified process on the basis of the cost per unit of *value* it delivered, we would have to conclude that the apparent improvement in the *value efficiency of the process's cycle time* (VAR) actually eroded the *value efficiency of the process* itself. This would be so because the value of the output remained unchanged yet its cost increased. This is problematic from a lean perspective

¹ This essay assumes that the value added ratio (VAR) is computed by dividing total cycle time into the time spent in activities that add value and multiplying that resultant by 100%. It further assumes that (1) cycle time is the time spent by a product as it traverses a process's *critical path* and that (2) it can be measured either by timing the interval between products exiting a process or by observing the passage of a process's initial input as it is transformed along the critical path and measuring the time consumed by every activity or wait state that occurs as it progresses (i.e., doing a process observation).

² This statement relies on Rather and Shook's definition of cycle time. See Rather and Shook (2003, p. 19).

³ We define the purpose of lean commerce as maximizing the delivery of value to customers while benefiting all stakeholders inclusively.

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because almost always—if not always—minimizing cost from the customer’s perspective is a customer value. Therefore, the improved VAR would potentially reduce the total value delivered to customers and not raise it. Rather than be an indicator of improvement, it would hide the fact that the process became less “lean.”

Reason for the Problem

The VAR only addresses the percent of cycle time spent in wasteful activities, not the total operating resources spent in doing wasteful activities nor the ratio of total resources expended to the actual value of the output produced. It is possible, therefore, to reduce cycle time waste while increasing the expenditure of operating resources on doing wasteful activities. It is also potentially possible to reduce the percentage of cycle time that is waste while diminishing the total value delivered to customers.

Challenge

How to ensure that the VAR always provides useful information about a process’s progress in better enabling a business to accomplish the purpose of lean enterprise.

Direction

This is not a simple problem to solve. Theoretically, one could prescribe that any improvement in the VAR must also improve the value efficiency of the process in terms of its ratio of total resources expended to the amount of value its output delivers. But how do we measure the value efficiency of the process in those terms? Logically it would require calibrating the value content of the output and generating a cost per unit of value produced. Such a ratio might legitimately be labeled the *value efficiency ratio of the process*. If we had such a metric, one could then verify that a solution to eliminating waste in the process’s cycle time also improved the value efficiency ratio of the process. But operationalizing such a metric remains theoretical. It requires devising a method for calibrating the value content of the output a process generates.⁴ If such a metric were developed, it would perhaps be the most important measure to monitor from a lean perspective.

An obvious alternative would be to require that VAR improvement be cost neutral or cost reducing. But this solution has problems as well. First, what if the solution that reduced cycle time waste actually increased the value content of the process’s output but at added cost? That VAR improvement would not reduce cost nor be cost neutral but it might actually improve the value efficiency of the process. For example, what if a specific waste activity in cycle time was due to how a feature of the product was specified and the solution was to change the feature thus eliminating the waste activity. It might also occur that the modified feature was even more desirable than what it replaced. That change would both eliminate a wasteful activity (improving VAR) and enhance the total value of the process’s output. Even if cost were elevated, its increase might

⁴ Volume 2 of our book, *Lean Enterprise: An Alternative Approach to Commerce*, actually provides a means for doing this. We translate customer values into a metrics that are applied to every feature of an offering. Using this approach, one could score an offering based on how well it satisfied those metrics. If we divided the offering’s total value score by its unit cost, we would have a value efficiency ratio.

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be more than offset by the increase in the value of the output. Or, what if the improvement did not add value to the content of the output and did add cost but resulted in the better satisfaction of customer values *in total* because, for example, the added throughput due to reduced cycle time meant customers would be able to access and receive the product they desired rather than be denied it. These examples suggest that placing the constraint that VAR improvement be cost reducing or cost neutral would not ensure a lean compatible result.

It seems that, in some way, one needs to calibrate the value efficiency of the process in the manner described above so that it acts as the constraint on the actions one might take to improve a process's VAR. Yet, the second example in the paragraph above suggests that this solution might not always work. In that example, a specific process might lose its value efficiency (value produced/cost per unit of output) but cease being a bottleneck that prevents any value flowing to all the customers who desire it.

Exhibit 1 summarizes this paper's analysis of the pluses and minuses of VAR as a lean metric.

Exhibit 1. Analysis of the Significance of the Value Added Ratio (VAR) as a Measure of Lean	
Potential Benefits	
1.	VAR does gauge the degree to which time spent on a process's critical path (assuming cycle time is used to compute the ratio) is value adding as opposed to waste.
2.	Provides a relatively easy way to gauge improvement in the degree to which elements that consume time on a process's critical path are value adding.
Actual Limitations	
1.	Does not measure all the value adding time spent in a process because it only registers activity on the critical path. Time spent in value adding activity that occurs in parallel operations is not registered.
2.	Does not measure all the waste time in a process because it only registers activity on the critical path. Waste activity that occurs in parallel operations is not registered.
3.	Does not measure the total resources consumed by the process. A solution to improving VAR might actually increase the expenditure of resources by a process.
4.	Does not measure the amount of value generated by value adding activities, only the time spent in such activities.
5.	Does not speak you the economic efficiency with which a unit of output value is produced. Therefore it is possible to improve the VAR while reducing either or both the traditional cost efficiency of the process or the value efficiency of the process. This results in a process appearing to become more lean enabling actually being more 'lean disabling.'
6.	The VAR improvement of process does not reflect the impact of that process's improvement on the value stream to which the process contributes either in terms of the value it delivers to customers or the degree to which it satisfies stakeholder expectation. It is possible to improve the VAR of a process while not having any impact on the valued delivered to customers by its parent value stream or the degree to which it satisfies stakeholder expectations.

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A Possible Work Around

In the absence of a definitive approach to ensuring that an improved VAR actually means that a process is better enabling the achievement of lean commerce's purpose, here are a few suggestions.

1. Never use a single lean metric to judge one's progress is realizing lean's purpose. Always evaluate the meaning of any metric within the context of all its other metrics. This may help avoid inappropriate interpretations of progress.
2. Always assess the impact of a VAR improvement at the process level on the value delivered to customers by the value stream to which the process contributes and the degree to which it satisfies the expectation of all its stakeholders. If either or both of these affects are positive, then the VAR improvement may have merit. Otherwise, the VAR improvement as an indicator that a process is better enabling the achievement of lean commerce's purpose is suspect.
3. Always assess the impact of a VAR improvement on unit cost and the value content of the output the process produces. If the unit cost remains the same or decreases and the process output's value content is either unchanged or improved and the impact of the improvement on its value stream's performance (2) is positive, then the VAR improvement is likely to be lean enabling.

Final Words

Even this paper's analysis of the VAR, however, is not the whole story with regard to problems associated with that metric. An even more fundamental issue concerning VAR is raised in the essay, *Lean Insanity*. That issue addresses how VAR is actually computed. While everyone assumes that it is done only one way—the way they do it—the lean literature suggests otherwise.

Reference

Rather, M. & Shook, J. (1999). *Learning to see*. Cambridge: MA, Lean Enterprise Institute.

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For Chris and Raphael to Discuss: Concerns/Issues/Questions/I Don't Knows

1. How real is this issue VAR gaming issue? It seems to be a stretch to come up with real world examples where people would do this or get away with doing this—that is, reducing the percentage of cycle time spent in waste not by eliminating or limiting the wasteful activity but by eliminating its affects on total cycle time (e.g., hiding it by dividing it into elements that are done in parallel).
2. On second thought, there is the entire method of setup reduction that externalizes setup but does not eliminate it. But, that solution uses wait time so it does not use more resources but it also does not reduce the amount of labor resources consumed by the process. While that is considered okay, since it makes labor time “more productive”—it may not, in fact, even reduce the total monetary resources expended. Also, it actually does not *reduce* setup waste per se. It only “hides” it from a time perspective by taking it off the process’s critical path.
3. Irrespective of the potential VAR improvement distortion, I think the *value efficiency of a process* measured in terms of the cost per unit of real value produced is a valid metric. It better reflects lean’s purpose because it relates to what the customer gets. Clearly VAR may or may not impact the customer at all. Its pivotal assumption is that waste increases cost and its removal decreases cost. But there is nothing in its removal or measurement that ensures that the cost reduction it produces (assuming it does produce one) passes to the customer or otherwise adds value in a way the customer experiences.
4. Also, this discussion makes me think that there is no process metric that measures the process’s output of value at all. Yet, value delivered to the customer is what is most important in the lean approach to commerce.