

LEAN ACCOUNTING: TO BECOME LEAN,

This article draws on comparative case research
to document the claim that the pathway to genuinely lean operations
is to shed accounting from operations.

SHED ACCOUNTING®

H. THOMAS JOHNSON, PH.D.

Reading the program materials that were sent out for the Lean Accounting Summit conference gave me a strong feeling of *déjà vu*. For nearly 40 years I have attended and spoken at business conferences like this one. Always the issue is the same: What can we do to boost the competitiveness and the financial performance of American business—especially manufacturing businesses—in the face of growing market complexity and robust overseas competition? These conferences have offered wave after wave of management panaceas to answer this question. No panacea seems ever to work for very long, but the supply of new solutions seems inexhaustible. So here we are again, this time exploring accounting reforms that might remove obstacles to new “lean” manufacturing practices inspired by the legendary Toyota Production System. Some writers will no doubt refer to this “lean accounting” as the keystone in a new structure of “advanced manufacturing.” More humble assessments of the subject might note the humorous line that any manufacturer still in business today is, by definition, “advanced.”

My goal is to explore a claim I have made many times in the past decade or so, that

accounting control systems have been the number one enemy of sound operations management in American business for at least 50 years. I will focus on the implications for “lean accounting” of my personal discovery around a decade ago that accounting control systems play no role in Toyota’s operations. This absence of accounting controls, like the absence of external production controls in Toyota’s shopfloor operations, is virtually incomprehensible to the average person trained in American business schools or employed in American businesses since the 1950s. American-trained business people are accustomed to believing that what matters in a business is ultimately expressed and controlled through the language of quantitative data, especially accounting data.

Quantitative abstraction, lost concreteness, and levels of thinking

Their belief in the power of quantitative abstractions, reinforced by the emphasis on quantitative modeling in American business schools over the past three generations, has all but caused American managers to lose sight of the underlying reality from which financial and other quantitative abstractions emerge. This lost connection with reality was anticipated in the writings of the philosopher-mathematician Alfred North Whitehead in the 1920s when he referred to “the fallacy of misplaced concreteness” as one of the great weaknesses of

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modern thinking. In his view, humans are equipped instinctively to abstract, but only in modern times has this led to a widespread tendency to erroneously view abstractions themselves as the concrete reality from which they emerge. Somewhat after Whitehead's time, the systems thinker Gregory Bateson echoed the same theme by saying that abstractionists too often confuse "the map with the territory" or "the menu with the meal."

In terms of the subject "lean accounting," I argue that the widespread use of accounting control systems to drive operations in businesses rests on an erroneous belief that financial or other quantitative targets can be used to explain, motivate, and control financial results in a business. Managing operations according to that belief has, I think, fatal consequences for any business. W. Edwards Deming, one of the foremost systems thinkers of the past century and a creator of modern quality management, argued many decades ago that good management means focusing on the system, not on achieving targets. Moreover, the Toyota Production System, the ostensible archetype of what most people call "lean," embodies the same thinking at its very core.

First, I want to challenge and clarify some of the common interpretations that people give to the terms lean and accounting. Lean, as it is used in most management literature today, emphasizes "shedding" and "losing" excess or waste. Shedding pounds in order to look lean and trim is a national obsession with Americans. American businesses embark on campaigns to shed waste and excess from operations. Individuals and companies everywhere in the country talk about being lean and many even do something about it, at least once in a while. But almost no one—individual or business—ever achieves a permanent state of lean where they never think about it but simply live in a way that makes that state inevitable. In other words, almost no one migrates to a way of thinking that eliminates the waste of thinking about eliminating waste. To reach that goal, one must view lean as a new way of thinking that leads to a desired state, not as a condition that we somehow achieve while staying at the level of thinking that got us to our present "unlean" state.

As for the term accounting, I generally use it to mean management accounting and

control systems, not the accounting systems that companies use to compile data for reporting financial results. Companies in today's world must keep books and report financial results to comply with numerous laws and regulations and to communicate with financial institutions and markets. They also should keep track of cash and cash obligations, regardless of the regulations they face. To not do these things is often illegal and generally stupid. On those terms, financial accounting is not a waste, although certainly any company can always do more to streamline accounting processes and reduce the time it takes to keep books and compile reports. Thus, when I talk about accounting as a form of waste I mean the use of accounting information to set targets for the purpose of controlling and motivating people's actions in an organization. Such use of accounting information implies an inherently destructive mechanistic way of thinking that we must transcend soon or we will not survive as a species.

The question I want to raise here is whether lean and accounting should be the main subjects we attend to at this conference. Indeed, I believe our attention should focus mainly on ways of thinking—the thinking that got business where it is and alternative ways of thinking that can lead it to a more desirable state. Get the thinking right and lean and accounting will fall into their proper places.

A statement often attributed to Albert Einstein captures what I am saying. Einstein supposedly remarked that it is not possible to solve a problem at the level of thinking that created the problem in the first place. In other words, to try solving a problem with the thinking that created it is tantamount to treating symptoms of a disease with temporary palliatives and not looking deeper to find and treat root causes of the disease itself. Or, to paraphrase systems thinker Russ Ackoff, better and better answers to a question are of no use if you are asking the wrong question. Explore alternative questions before you fashion answers to the wrong question.

Activity-based costing: good answer, poor question

The main track of my message—how we become lean by shedding accounting—



ACCOUNTING CONTROL SYSTEMS HAVE BEEN THE NUMBER ONE ENEMY OF SOUND OPERATIONS MANAGEMENT IN AMERICAN BUSINESS FOR AT LEAST 50 YEARS.

begins with a story about the development of activity-based costing (ABC) that I participated in some 20 years ago. ABC emerged in the mid-1980s to fill a need companies felt for more reliable cost information to make better business decisions. The need arose because a pronounced and pervasive shift in the structure of overhead costs in American businesses during the 1970s and early 1980s caused product cost information to become increasingly distorted and less reliable for good decision making. The traditional way to allocate overhead to products—in proportion to the direct labor or machine hours spent in making each product—distorted costs increasingly in the 1970s and 1980s. The issue was that direct labor and machine hours accounted for a proportionately smaller amount of overhead costs each year. Instead, growing complexity of products and processes caused companies to devote relatively more time to activities required by increasingly complicated and prolonged material flows. Ironically, this material flow complexity arose from following the accounting logic that says low costs are achieved when the cost of each separate process is minimized by adopting departmental plant layouts, high speed-machines, and unnecessary automation.

These steps, aimed at minimizing costs in each and every separate process, generated additional activities including: ordering and handling more part numbers, storing and handling growing inventories, inspecting and reworking processing errors, changing over more complex machines to accommodate growing varieties of products, running increasingly complex information systems to plan and control the flow of material, and much more. The volume of those activities, largely unrelated to direct labor or machine hours, caused more and more of the overhead costs as time passed.

ABC was designed to eliminate the cross-subsidies and other sources of distortion caused when overhead costs are allocated to products in proportion to their direct labor hours. Instead, ABC traced overhead cost to products according to the actual costs of the particular overhead activities required to make and sell each product. I am sure that ABC improved the quality of product cost information. Its use probably helped executives identify product profit mar-

gins more reliably. Whether or not that led to decisions that improved overall profitability over the long run is less certain. Chasing product margins as a way to maximize profit may make sense on an accounting spreadsheet, but it ignores the fact that high accounting margins often go with a product that is passing its prime, while low margins may be earned by newcomers that, with proper nurturing, will become high runners in the future. Basing bottom-line decisions on accounting information is tricky at best, and usually disappointing if done habitually.

This lesson was driven home to me by certain manufacturing engineers and quality management authorities I met on the ABC talk circuit in the late 1980s. They told me that ABC ignored root causes of overhead cost such as using high-speed machines, departmental layouts, and unnecessary automation to optimize local costs; hence, it did not offer a radical program to eliminate overhead. In fact, ABC did nothing to change the old thinking that assumed accounting information was the primary means to control overhead costs and to achieve better bottom-line results. ABC was merely an accounting answer to an accounting question. The question ABC addressed was how to get the best cost data for making decisions to control costs and boost the bottom line. The answer was to design the cost accounting system we know as ABC.

An alternative question that these manufacturing and quality authorities told me to consider was how to organize work at the lowest cost by optimizing the whole system, not just separate piece-part operations. They suggested to me that it is possible to organize and conduct work in such a way that the overhead activities most American businesses take for granted would virtually disappear, making it unnecessary to design and build elaborate cost accounting systems, especially those of the ABC variety. Thus, by shifting the question they invalidated the answer that many of us had spent years crafting. That answer,

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ABC, required one to assume that accounting data was the appropriate tool for controlling costs. Given that assumption, the relevant question was how to get the best cost data to manage costs and profits. But if one's thinking shifted and the question asked was how to organize work so that overhead activities vanished, then designing a better system to cost products was no longer a useful answer.

Discovering Toyota

When I asked these manufacturing and quality experts what answer they had to this new question—how to organize work to achieve the lowest costs—they simply said, “study Toyota.” That was fair enough since most of them had written extensively on the Toyota Production System (TPS). It was around 1987 or so when I began reading all I could get my hands on about Toyota and its operations management technique. I also spoke with many writers and consultants who had visited Toyota in Japan. The result was that I came to understand how the company had designed its operations so that it avoided the indirect or overhead activities so prevalent in American business. Therefore, Toyota had no use for management accounting and control systems to control, motivate, and assess operations. I also began to appreciate that because of the way it organized the flow of work in its operations, Toyota also did not require production control systems to release and route material flows on the shop floor.

So, on the basis of this new-found knowledge I wrote a book, *Relevance Regained*, telling the business world in 1992 that it was time to stop overselling ABC and to begin paying more attention to the design of operations.¹ The book did manage to alienate the cost management community. More importantly, it attracted the attention of Kazuhiro Mishina, a young industrial engineering professor from Japan who was teaching at Harvard Business School. Kazuhiro was writing cases about Toyota's new plant in Georgetown, Kentucky under the sponsorship of Mr. Fujio Cho, then President of the Georgetown facility, Toyota's only fully owned facility in North America at the time. Kazuhiro and Mr. Cho liked my message and invited me to come

to Georgetown to learn first-hand what TPS was all about.

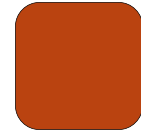
Thus, starting in 1992 and for about 10 years I visited Georgetown on scores of occasions when I was allowed to work on kaizen teams, participate in TPS training, and interview countless employees in virtually every department of the plant. This experience enabled me to write several articles on Toyota's practices and, by 2000, to produce another book, *Profit Beyond Measure*, in which I compare Toyota's operations with the operations of living systems in nature.² In more recent writings I go on to specify inherent features and implicit ways of thinking in three business models that encapsulate most of what has emerged from my studies of the past 15 years or so:³

Model one

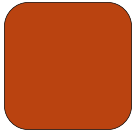
Featuring uneven and unstable batch-and-queue material flows, this model still dominates operations in most American business and is at the heart of university operations management and management accounting courses. I associate this model with the mechanical way of thinking that emerged from classical physics in the 17th and 18th centuries. This model assumes that a business is a collection of independent parts, assembled by external design and altered only by external force or outside intervention. The model also assumes that nothing matters that cannot be measured and expressed in terms of financial quantity. Finally, the model assumes that all change is linear and additive and a whole is never more than the linear sum of its parts. In other words, every effect/result has a precise cause and cause and effect can always be defined in linear and additive terms. On that belief rests the idea that a management accounting and control system provides appropriate “levers of control” with which to control costs and maintain desired levels of profitability.

Model two

Second is the systems model that I associate with the Toyota Production System and most people identify with the term “lean.” This model grew out of the systemic mode of thinking that emerged in the 1930s and



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IN THE FUTURE STATE SHAPED BY MORE SYSTEMIC THINKING, ONE OF THE FIRST THINGS WE NOTE IS THE DISAPPEARANCE OF THE PRODUCTION CONTROL SYSTEM.

1940s from the biological sciences and cybernetics. This model assumes that a business is a community of interdependent parts that self-organize into a coherent whole that is greater than the sum of its parts. Quantities can describe features of the whole, such as cost or profit, but quantity and measures cannot explain the patterns of non-linear relationships and feedback that determine such features.

Unfortunately, most “lean” businesses in America today espouse a continuing belief, characteristic of mechanical-model organizations, that growth without limit, dictated by finance models of wealth maximization, is feasible and possible. These businesses, especially ones publicly traded, ignore an unresolvable tension between that growth imperative and the thinking present in the systemic Toyota-style model that says the best long-term results are not caused by intervening in the system with targets but, rather, by designing the system properly and letting results happen. Adhering both to the growth imperative and to mechanical principles of financial control inevitably corrupts TPS, I believe. Even the Toyota Motor Corporation itself is not immune to this corruption.

Model three

The third model is the living system that I connect with the concept of sustainability. In a sense this is the “ultimate lean” system. Here growth is explicitly rejected beyond the growth inherent in the morphology of a species (i.e., ants grow to be ants, elephants to be elephants, and galaxies grow to be galaxies). The key to sustainability in our economic system is to live in harmony with Earth’s biosystem, to insure the possibility that all life on Earth will flourish indefinitely.⁴ The human economy and all businesses within it must work within the constraints of Earth’s system that sustains all life. Accounting information provides no help for understanding how that is done. However, I now believe that a company achieves its lowest possible operating costs when it conducts its operations sustainably, i.e., in harmony with the principles that guide living systems.

These three models embody distinct ways of thinking. Although the thinking embod-

ied in the third model—true sustainability—goes beyond the scope of this article, I explore it in an article that will appear in the next issue of this journal. The remainder of this article explores the thinking embodied in the first two models, which is implicit in what the value-stream mapping literature refers to as a “current state” (embodying mechanistic thinking) and a “future state” (embodying systems thinking). Different modes of thinking determine the different systems for production and cost control in the current and future states.

In the current state shaped by mechanical mass-production thinking, standard cost variance systems are used to control costs by setting targets and monitoring variances. Standard cost control systems had been in vogue for 30 years or more when production control systems like MRP began to appear in the 1950s. Surprisingly, value-stream maps never show these standard cost control systems, although they do show production control systems. Nevertheless, cost control systems, in my opinion, did much to rationalize and make secure the convoluted mess in American companies that one sees depicted in the current state in the typical value-stream map. The most destructive aspect of these variance control systems is their emphasis on minimizing costs in separate parts of an operation, the theory being that if the whole is the sum of its parts then the lowest total cost is reached by achieving the lowest possible costs in each and every part.

The flaw in this reasoning is to not recognize that optimizing parts in a system of interconnected processes creates imbalances and disruptions that create delays and the need for extra work, and added cost, if the whole is to function effectively. Thus, the consequence of optimizing parts, as Amory Lovins wittily puts it, has been to pessimize the whole. Unfortunately, over the past 50 years, American operations managers, driven by accounting targets, have too often responded to the pessimization of total costs by trying harder and harder to minimize unit costs in the parts by building machines to larger scale that operate at higher speeds, thus making things even worse.

Supposedly saving managers from the resulting chaos and confusion that this

behavior creates are computerized production control systems introduced after the 1950s: MRP (material requirements planning), MRPII and MRP III (manufacturing resource planning) and, today, ERP (enterprise resource planning). The value stream maps do a good job of portraying these production control systems in the current state. However, the maps fail to similarly portray the management accounting and control systems that bring to the shopfloor the accounting data on overhead costs, targets, and variances that are used to drive production and staffing decisions. Those systems, not MRP, helped create the current mess and continue to reinforce it to this day.

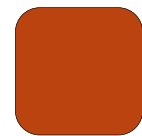
In the future state shaped by more systemic thinking, one of the first things we note is the disappearance of the production control system that released and routed all work on the floor in the current state. Indeed, this is one of the defining features of the future state: the new way of organizing work as a continuous, balanced flow obviates the need for external controls like the production controls found in the current state. But the management accounting control system, although central to the running of the current state, does not appear on the current state map. Thus, its absence from the future state map is never noted. As a result few people pay attention to how the new way of organizing work in the future state not only obviates the need for external production controls, but for external management accounting controls as well.

Ironically, many writers on lean now seem bent on adding external financial controls to the future state, even though they would never press to add production controls such as MRP to the future state. This reflects, I believe, that American managers today have almost no sense of what it means to manage without numbers, i.e., to manage systemically. Hence, when they look at a future state map they see a vacuum—no system for monitoring the work with accounting numbers. As in nature, accounting types abhor a vacuum and will inevitably try to fill the future state with management accounting controls, including performance indicators such as cost per unit, meant to drive behavior with abstract targets. If they succeed, the accountants may kill the goose that lays golden eggs.

Here's the issue: when I first visited Toyota in Georgetown, perhaps because I was then identified as an accountant, people there took a special effort to show me that the accounting system does not enter the shop floor. The plant, they told me, was like a black box that the accounting system does not enter. The accounting system goes up to the front door where resources enter the plant and there it records people, material, supplies, parts, utilities etc. that enter the plant; it also sits at the back door where cars come out and there it records shipments and sales. Because the Toyota Production System is in place inside the plant there is no need for the accounting system to go there to insure proper recording of all that matters to keep the books and compile data for financial reports.

I am surprised at how few writers on TPS have commented on this accounting "black box"—almost none in fact. But there it is. Toyota, perhaps since the 1960s, has not allowed external management accounting controls on the shop floor, just as it doesn't allow external production controls on the floor. If you find someone who is selling the idea of incorporating management accounting controls into lean operations, be wary. Even if that person is a Toyota manager! Americans employed by Toyota but trained in American universities and having prior experience in American companies seem genetically inclined to manage by numbers. If that gene should ever gain ascendancy in Toyota management circles, I am afraid the company will be in deep trouble.

Before I turn to a story that captures the main points I have made here (and more), one final note: A central theme in lean is, of course, to achieve costs as low as possible. Indeed, the TPS at its core is a system for achieving the lowest possible cost. But a key difference between the systemic Toyota approach and the mechanistic American approach to cost control is that the TPS focuses attention on consuming less, whereas the American system focuses on producing more. In large part this is because Toyota from way back thought of cost in terms of total cost, not average unit cost. Perhaps that was a reflection of scarcity in Japan versus great abundance in America. The Toyota people were directly focused on the concrete



THE NEW WAY OF ORGANIZING WORK AS A CONTINUOUS, BALANCED FLOW OBTAINES THE NEED FOR EXTERNAL CONTROLS.

and the real—the total cost—whereas Americans focused on the abstract—the average unit cost. That is a theme that runs through all of the American experience—the very use of quantity as the lens to define and control outcomes reflects loss of contact with the real and the concrete. The following story about bumper making shows vividly how this can be true.

The bumper story

The goal of this story is to give a concrete example of the difference in results between a company that organizes its operations according to systemic principles and one that drives its operations mechanistically with targets and accounting controls. The story is presented in an award-winning article that is based on research that Professor David S. Cochran directed through the Production System Design Laboratory that he founded and supervised at MIT.⁵ The story concerns two bumper-making plants operated by two separate automobile manufacturing companies in the central Ohio River valley in the United States. Both plants use essentially the same processes and equipment— injection molding, painting, and subassembly—and the same workforce to produce essentially the same product— plastic automobile bumpers—for nearly identical customers. What is strikingly different about the two plants is the thinking of top management in each parent automobile company about how to conduct operations to achieve the lowest possible cost.

Comparing these two plants more or less approximates a controlled experiment designed to isolate all variables affecting overall results except for top managements' thinking about how to conduct operations to achieve minimal cost. The thinking that shapes operations in one of these plants, call it Plant M, resembles the mechanistic mass-production thinking usually associated with the “current state” in value-stream maps. This is the thinking that has shaped operations in most American manufacturing organizations from the 1950s to the present day. The central tenet of this thinking is that low cost, defined as low average cost per unit of output, is achieved by running every facet of operations “efficiently.” Efficiency, in this sense, means achieving low average

unit cost in every process of a plant by having each process produce as much as possible as fast as possible. In other words, operations are designed so that output volume can be increased as necessary to “absorb” so-called “fixed” costs and overhead in order to achieve unit cost targets. An implicit assumption is that total cost per unit of a plant’s finished product is the sum of cost per unit in each and every process that contributes to making the product. Thus, accounting cost controls are used to monitor and motivate efforts by operating personnel to achieve unit cost targets by manipulating conditions in every process.

Plant M relies on an abstract financial model of unit cost similar to that shown in Exhibit 1 to define the efforts operating personnel are expected to take to achieve unit cost targets. Basically, operators aim to hit ever-shrinking unit cost targets by driving up the rate at which they produce units of output, by driving down the hours of direct labor in each process, and by increasing the size and speed of machinery. Viewing the model of quantitative abstractions as the primary reality they face, operators take actions to achieve cost targets that can have unexpected consequences for the concrete reality of people and machines in the processes they run.

Exhibit 2 depicts some of the concrete consequences for Plant M of having its operators, over the course of many years, manage the plant’s processes so as to achieve low average unit cost of output according to the requirements of the abstract financial model in Exhibit 1. Each process— injection molding, paint, and subassembly— operates at a cycle time that maximizes speed of output, at least when the process is running, but does not synchronize in any way with cycle times in other processes, including the final customer’s three auto assembly plants that install Plant M’s bumpers on finished automobiles. The widely varying process cycle times and departmental run-time hours are accommodated by the inventory buffer in Plant M’s very large automated storage

AMERICAN MANAGERS TODAY HAVE ALMOST NO SENSE OF WHAT IT MEANS TO MANAGE WITHOUT NUMBERS, I.E., TO MANAGE SYSTEMICALLY.

EXHIBIT 1 Plant M: Financial Cost Targets Drive Behavior Aimed at Achieving “Efficiency”

The model

Unit Cost_(ops) = (Direct Labor+Material+Overhead Allocation)/ Units Produced
Overhead Allocation = (Direct Labor in a Product / Total DL) X (Total Overhead)

The goal (whole = sum of parts)

Minimize cost per bumper by minimizing unit cost in every department

The decisions (to achieve unit cost targets)

Increase units produced
Drive out direct labor (hours and rate)
Install bigger, faster machines (increases units produced and drives out labor hours)

and retrieval system (AS/RS). The AS/RS inventory also buffers a high rate of fall-out from the paint process caused in large part by the high speed of the automated paint system that is intended to maximize efficiency of output.

The value stream map of the material and information flow in Plant M shown in Exhibit 3 can portray several other concrete consequences of running Plant M according to the terms of the abstract model in Exhibit 1. One consequence is an enormous difference between the very long time a bumper actually sits in the plant from the start of production until it is shipped to a customer and the much, much shorter time it would take a bumper to pass from start to shipping if there were no delays or interruptions anywhere along the way. Although confidentiality precluded showing the actual times in this case, the value stream map, unlike the floor layout map, can make visible the delays and imbalances in the “flow” of material that causes total lead time to greatly exceed total process time in Plant M. The value stream map also makes visible the external production control system—an advanced MRP system that releases all material to the floor and schedules its routing from process to process, including transit in and out of inventory buffers.

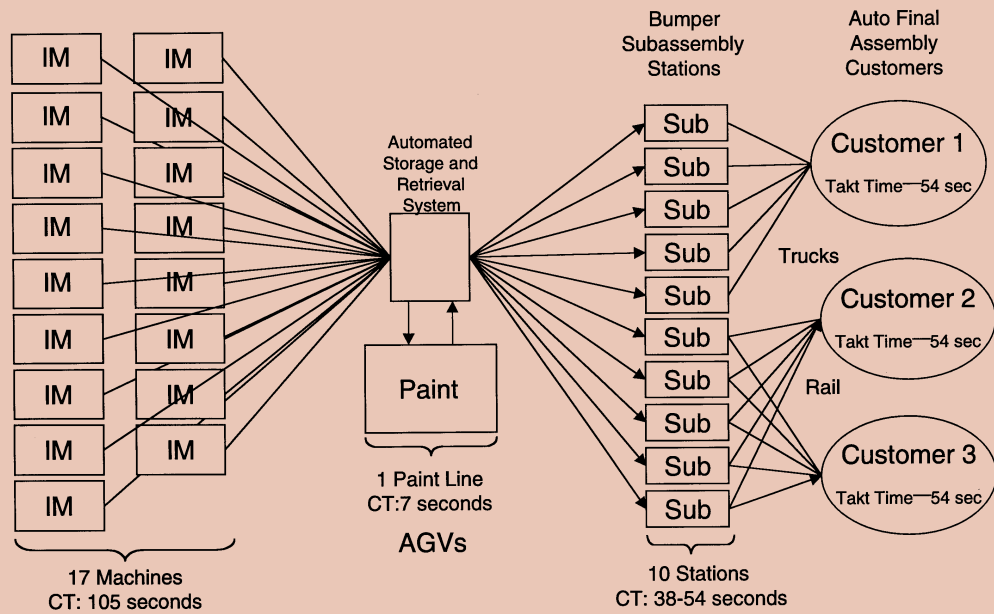
One thing Plant M has that neither the plant layout map nor the value stream map make visible is an entrenched standard cost control system run by the accounting department. Like the MRP production control system, the cost control system imposes external targets and instructions on the operators

of the production system. The cost control system compiles targets and variances with information from outside the flow of operations and uses such targets and variances to drive the flow of material through the operating system.

A more systemic mode of thinking shapes operations in the other bumper-making plant, Plant L. This thinking resembles the thinking usually associated with the “future state” or “lean” state in value-stream maps. Central to this mode of thinking is the belief that low cost is achieved by designing operations according to systemic principles, perhaps principles similar to those that guide natural living systems, not according to quantitative relationships defined in an abstract financial model. In Plant L, operations are not designed so as to achieve low average unit costs; they are designed to achieve the lowest consumption of resources needed to achieve customer requirements in each step of every process. Work is designed to flow continuously at the average pace of customer demand, called the takt time, throughout the plant. Every person (or machine) at every step in each process knows exactly what to do (standardized work) and they know by direct communication with someone they supply (internal customer) when to do it and where to deliver it. Moreover, the design of work enables every person at each step to see abnormality where and when it occurs and to stop and correct it on the spot.⁶

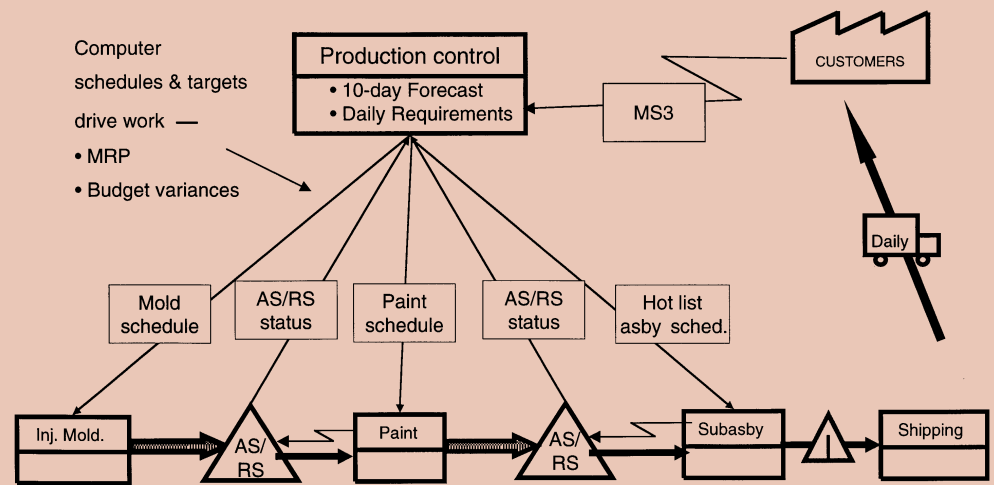
Exhibit 4 shows some of the concrete consequences for Plant L of managing its processes over many years so as to achieve

EXHIBIT 2 Plant M: Floor Layout⁵



Adapted from DS Cochran, www.sysdesign.org

EXHIBIT 3 Plant M: Value Stream Map⁵

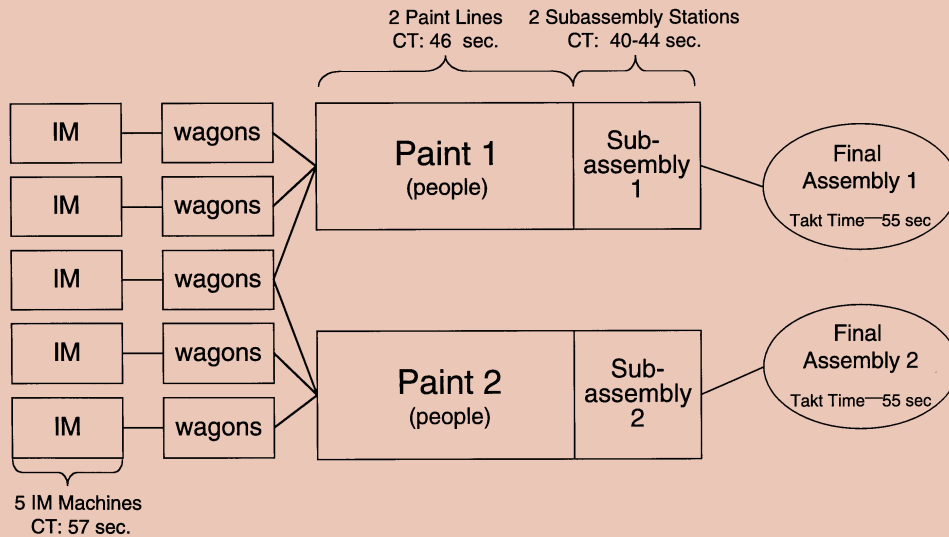


Adapted from DS Cochran, www.sysdesign.org

low total costs, not low average unit costs, by following principles such as pacing all work to a common rate that is tied to customer demand, connecting all processes in a continuous flow that avoids delays and interruptions as much as humanly possible, enabling every worker at every moment

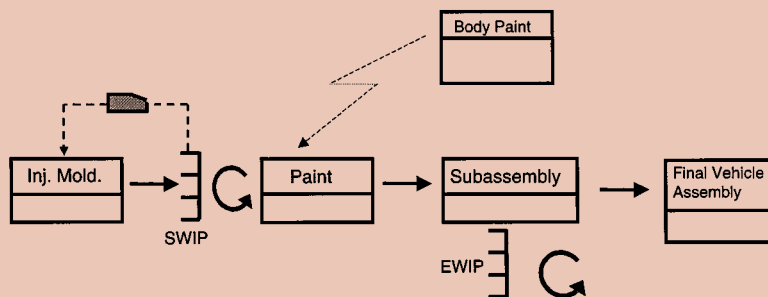
to detect abnormality and stop to correct it, and encouraging every person in the system to constantly seek opportunities to make changes leading to improved results. In Plant L each process—the same processes as those in Plant M—operates at a cycle time that synchronizes with times

EXHIBIT 4 Plant L: Floor Layout⁵



Adapted from DS Cochran, www.sysdesign.org

EXHIBIT 5 Plant L: Value Stream Map⁵



- No Computers**
- customer demand drives work
 - no MRP
 - no accounting targets, variances, etc.

Adapted from DS Cochran, www.sysdesign.org

in every other process, including the customer's. As a result of work flowing at the pace set by its customer, vehicle assembly, and because processes are stabilized through standard work practices and operations, inventories are virtually absent in Plant L.

Had confidentiality not precluded showing actual times for Plant L, as it also did for Plant M, the value stream map for Plant L shown in Exhibit 5 would reveal that as a further consequence of how work is paced

and balanced, the lead-time and the total process time of making a bumper in Plant L are more or less equal. Moreover, there is no external production control system visible in Exhibit 5. That is because there is none—the work itself, through in-line replenishment systems and internal customer-supplier connections, is its own control system. And that goes for cost control as well as production control. No accounting targets or variance reports appear on the shop floor in Plant L.

EXHIBIT 6 Results⁵

Measurables Overall	Plant L	Plant M
Floor Area	1	1.08
Inventory	1	7.46
Throughput Time	1	10.30
Capital Investment	1	1.57
Direct Workers	1	2.70
Indirect Workers	1	1.17
Good Parts/Labor-hour	1	0.85
Total Cost per Bumper	1	>>1.00

Adapted from DS Cochran, www.sysdesign.org

Exhibit 6 compares seven measures from actual data compiled during the research done at Plants L and M by Professor Cochran and his students between about 2000 and 2002. When one examines these measures of operational performance for the two plants it is perhaps no surprise that Plant L performs much, much better than Plant M on any measure one considers. This result, as explained more fully by David Cochran at www.sysdesign.org, is due to Plant L achieving more of the functions that meet customer needs. Plant M, focused primarily on satisfying the cost management system's operating measures, fails to reliably meet the needs of the vehicle assembly customer. Indeed, Plant M is not designed and does not operate to satisfy the customer needs. Plant L, however, is designed to meet customer needs in spite of problems. Plant L is self-regulating and self-correcting and requires no intervention from external sources.

Exhibit 6 avoids disclosing confidential data by transforming each measure from Plant L to an index of 1 and showing the corresponding measures from Plant M as multiples of 1. The measures were normalized to reflect the relatively smaller output of Plant L, which supplied two assembly customers rather than three and worked two shifts per day rather than three. Clearly, Plant L consumes less than Plant M across the board—space used, inventory, lead-time, capital, direct and indirect workers, and time per parts produced. The eighth measure, total cost, was not available from either company's account-

ing department for proprietary reasons. However, ample documentation exists to show that the parent company of Plant L is the lowest cost automaker in the world. For that reason and because Plant L's results are superior on the seven other measures in Exhibit 6 we assume that Plant L's cost to make bumpers is significantly less than Plant M's cost.

Conclusion

The story of Plants L and M intends to show that costs (and other results) can be quite different even in two organizations that make virtually the same product using almost the same resources and technologies. The difference in results between these two actual plants is attributed to the thinking of top management that shaped the design of their respective operations. Plant L was created by people who believe that the best results emanate from meeting customer needs and building operations as a collaborative system that focuses on relationships among people—employees, suppliers, customers, and the community affected by the company's operations. Plant M, however, was created by people who tacitly assume that the best results are achieved by driving and optimizing each part of the organization without consideration of the impact on every other part. The centerpiece to Plant M's operating system is a set of external accounting controls and production controls that focus everyone's work on achieving imposed targets, not on serving customers to the best of their abilities. Plant L, with

no such external controls, operates a self-organizing operation that is focused on people, not on quantitative targets.

And yet, Plant M that uses accounting controls to guide operations produces the poorest final results. Plant L, on the other hand, that uses no accounting controls, achieves the finest results. Inherent in this difference in outcomes is the failure of Plant M's creators to understand that accounting information may describe results, but it cannot explain what it is about operations that produces those results. Knowledge of what produces results requires one to understand relationships, systemic interdependencies, and internal feedback of the sort that stabilizes and "controls" a living system. That understanding cannot be achieved by studying quantitative accounting data. The language of accounting cannot explain what makes the differences between Plants L and M, even if it can measure those differences. In that sense, "lean accounting" seen as the use of accounting control systems to

manage lean operations is *muda*. The *muda* of accounting controls has crippled Plant M over the years; were it allowed to penetrate the operations of Plant L it would in time destroy it. ■

NOTES

- ¹ H. Thomas Johnson, *Relevance Regained* (New York: The Free Press, 1992).
- ² H. Thomas Johnson and Anders Broms, *Profit Beyond Measure* (New York: The Free Press, 2000).
- ³ H. Thomas Johnson, "A Former Management Accountant Reflects on his Journey through the World of Cost Management," *Accounting History* (May, 2002), pp. 9-21; "Confronting the Tyranny of Management by Numbers," *Reflections*, Vol. 5 (2004), pp. 1-11.
- ⁴ John Ehrenfeld, "Searching for Sustainability: No Quick Fix," *Reflections: The SoL Journal on Knowledge, Learning, and Change*, Vol. 5, No. 8 (2004), pp. 137-149.
- ⁵ D. Cochran, Linck, J., and Niese, P. "Evaluation of the Plant Designs of Two Automotive Suppliers Using the Manufacturing System Design Decomposition (MSDD)," *Transactions of NAMRI/SME*, Vol. XXIX, 2001. Awarded the 2002 Shingo Prize for Excellence in Manufacturing Research. Exhibits 2, 3, 4, 5, and 6 are adaptations of figures used in this reference. This reference and others by Cochran are located on the web at www.sysdesign.org.
- ⁶ Steven Spear and Kent Bowen, "Decoding the DNA of the Toyota Production System," *Harvard Business Review* (September/October 1999), pp. 97-106.