DON'T SHED ACCOUNTING, REENGINEER IT — WITH STRATEGY MANAGEMENT AND A3 THINKING

Forward-thinking organizations should consider utilizing a management by means approach that incorporates strategy management to redefine accounting and give themselves a competitive advantage.

THOMAS L. JACKSON

In a landmark article in this journal, noted accounting expert H. Thomas Johnson declared that "to become lean" organizations must "shed accounting." Johnson contrasted two models of management control, management by results (MBR) and management by means (MBM).[1] MBR is a Newtonian or mechanical model of external control, focused almost exclusively on financial results.[2] MBM is a biologically inspired, cybernetic model of internal or self-control, focused on the means by which financial results are achieved. Johnson seems hesitant to explain how exactly MBM might be operationalized. Lean organizations such as Toyota or the Danish firm Scania, he says, simply do not permit external accounting controls inside their factories; what is required is a new way of thinking. While I generally agree with Johnson, MBM requires more than thinking. As we will see, even the thinking required is not necessarily free; it is regulated — by the scientific method. Like most advanced control systems, MBM requires engineering.

In accounting, we automatically think of control in terms of budgets, internal audits, and compliance. According to Johnson, however, the so-called internal audits of management accounting constitute a primary example of MBR's mechanical or external control. To understand how to engineer a system of self-control, we obviously need a new way to look at the control problem that does not take audits for granted. In their article, "Who Needs Budgets?" for the *Harvard Business Review*, Jeremy Hope and Robin Fraser suggest that

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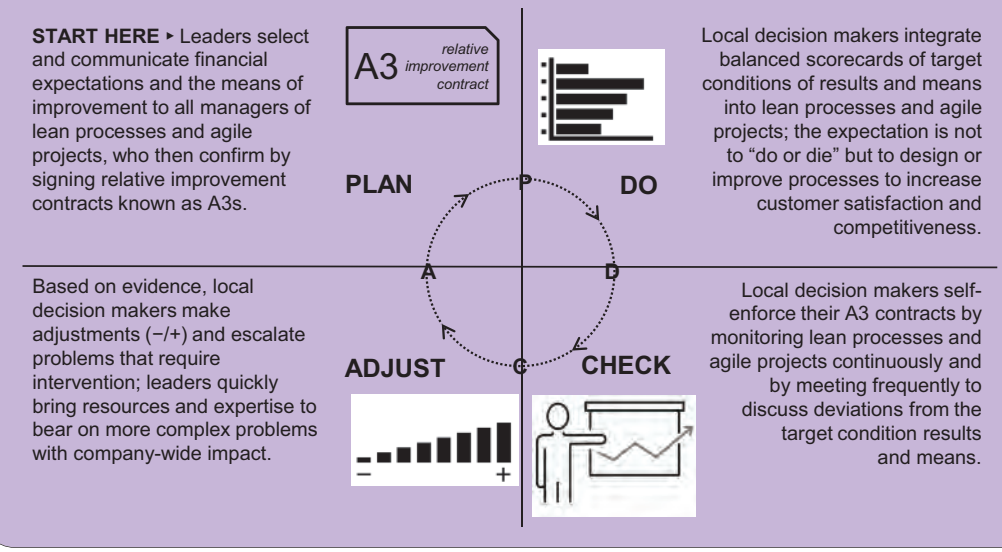
EXHIBIT 1 Strategy Management: A Framework for MBM



we think instead of contracts. Management accounting is characterized, they say, by a set of fixed performance contracts, the result of the traditional annual budgeting process. These are contracts offered to managers on a take-it-or-leave-it basis that tie personal compensation to compliance with a set of financial targets. Financial targets are set with "a little back and forth" at the top of the organization and remain fixed for the fiscal year. In contrast, MBM is characterized by a set of relative improvement contracts. Relative improvement contracts task managers with process improvements as well as financial results; improvements are related in a cause-and-effect way to financial outcomes, and compensation depends on progress, as measured by process improvements as well as outcomes. A key feature of relative improvement is that control is not exercised externally in performance reviews or audits but internally in the course of daily work by managers themselves. Managers are trusted to exercise self-control (see the sidebar entitled "Why Shed Accounting?").[3]

In this article, I will explain how to operationalize or engineer cybernetic management control using a relative improvement contract known as the A3, which is the core document in a strategy management system. Strategy management is the application of the Deming cycle of plan, do, check, and adjust (PDCA) to strategic planning, deployment, and execution (see Exhibit 1). First developed in Japan in the 1950s, strategy management is a system for articulating, deploying, and enforcing relative improvement contracts companywide. It easily meets standard engineering criteria for cybernetic control. Strategy management gathers, processes, and transmits all the information of traditional management accounting, including its annual budgeting process. It performs the work of feedback and control normally done by performance reviews and internal audits. It also encourages the thinking — sometimes referred to as A3 thinking — that Johnson demands. Exhibit 2 presents the major differences between MBR and MBM.[4] After a short discussion of the A3 process, this article explores the nature of the new management contract, communication, feedback, and management control.

Strategy management and the relative improvement contract

In contrast to the fixed performance contract of MBR, the relative improvement contract of MBM is not a set of marching orders offered on a take-it-or-leave-it basis; it is negotiable. During negotiations, many practitioners of strategy management utilize a contract template known as an A3. (A3 refers to the size of paper on which the contract is printed.) The template explicitly

EXHIBIT 2 An Engineering Perspective on MBR and MBM

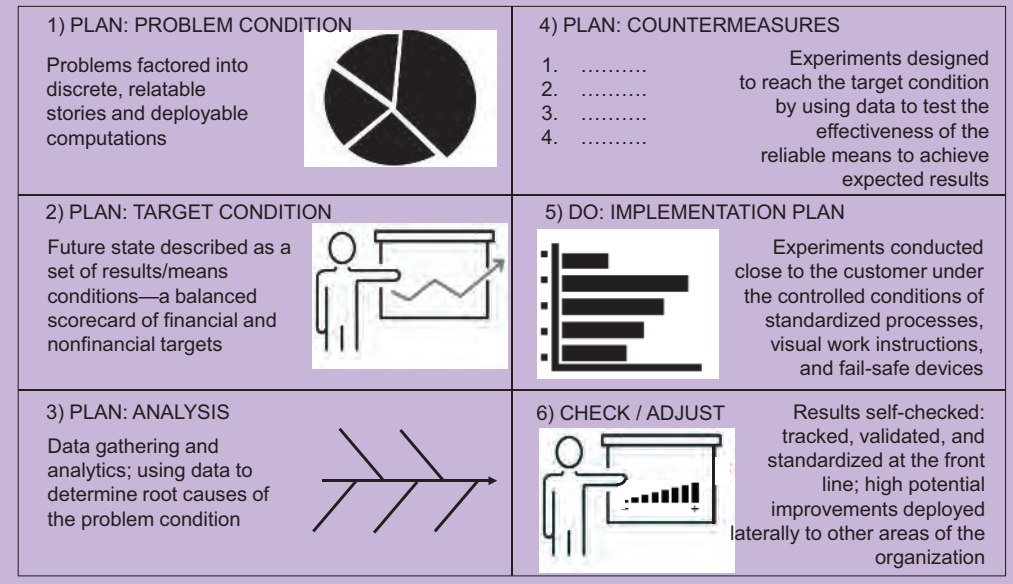
LEGEND			
	COMPLIANCE WITH CRITERION		
CYBERNETIC ENGINEERING	strong	medium	weak
	◉	○	△

TYPE OF SYSTEM			MANAGEMENT BY RESULTS Mechanical / command-and-control	MANAGEMENT BY MEANS Cybernetic / biological / self-control
TYPE OF CONTRACT			△ Fixed performance contracts	◉ Smart, relative improvement contracts
CYBERNETIC ENGINEERING FUNCTION	DEGREE OF DECENTRALIZATION		△ Normal decentralization: parallel processing for divisionalized or moderately decentralized organizations	◉ Radical decentralization: massively parallel processing for radically decentralized lean/agile organizations
	COMMUNICATION	TERMS OF AGREEMENT	△ Contract to "get things done" (i.e., to achieve financial targets by any means available)	◉ Contract to think (i.e., to solve problems, using the scientific method [PDCA] to test hypotheses about how certain means deliver results)
		EXTENT OF DEPLOYMENT	○ Traditional budgeting: top-down communication to divisional leaders and some middle managers	◉ Companywide communication of targets for results and means to all managers, including supervisors and team leaders
	FEEDBACK	NEGOTIATION PROCESS	△ Traditional budgeting: limited give-and-take at the top; take-it-or-leave-it throughout the rest of the organization	◉ Systematic give-and-take following the improvement *kata*, with confirmation memorialized in written agreements (A3s) from top to bottom of the organization
		FOCUS OF NEGOTIATIONS	△ Financial results	◉ Means as well as results: the balanced scorecard
	AUTOMATIC CONTROL	CONTRACT ENFORCEMENT	△ Mechanical control or post hoc compliance via quarterly reports and internal audits	◉ Automatic control: daily, monthly, quarterly meetings and visual control, checklists, and fail-safe devices
		PERFORMANCE REVIEW	△ Annual performance reviews supported by incentives tied to financial targets but not to means	◉ Frequent personal coaching supported by balanced paychecks of personal and team incentives tied to means as well as financial results

incorporates the scientific process that is used to encourage PDCA thinking (see Exhibit 3).[5]

The A3 is a license not only to think but to experiment. Because strategy management is explicitly based on PDCA, it treats results and means not as commands, as in the case of MBR, but rather as hypotheses to be tested empirically through experimentation. Failed hypotheses are not cause for disincentive, discipline, or dismissal, but are instead treated as opportunities for organizational learning. In Exhibit 3, we see how the plan phase of PDCA is documented in Sections 1–4. In Section 1, problems are first factored in a problem condition statement, so that managers may practically contribute to problem-solving within their respective spans of control. In Section 2, the target condition statement or future state is described in terms of process improvements and financial outcomes. Section 3, the analysis section, investigates root causes around the gap between problem condition and target condition. The proposed actions or countermeasures are outlined in Section 4 at the top of the next column. In Section 5, the do phase of PDCA is outlined with a Gantt or milestone chart. The check and adjust phases in Section 6 refer to the continuous monitoring of improvements and subsequent adjustments to the action plan. Inscribed conveniently on one piece of

EXHIBIT 3 Toyota's A3: The New Relative Improvement Contract



paper, here is a record of the thinking that Johnson calls for.

While MBM and the A3 require thinking, an MBM control system must be designed, engineered, and installed to regulate that thinking. In its essence, cybernetic control systems are all about the immediate detection and correction — in other words, the automatic regulation — of error. Norbert Weiner describes three criteria for a cybernetic system: communication, feedback, and automatic or self-control.[6] Applied to management control, these three criteria can be described as follows:

- *Communication* consists of messaging — to all decision-makers — of a target condition or strategic position to be achieved (or maintained homeostatically).
- *Feedback* consists of information provided to decision-makers about performance deviations from the target condition or strategic position.
- *Automatic control* consists of adjustments made by decision-makers, triggered by feedback, to bring the management system closer to the target condition or strategic position.

The PDCA cycle (and the scientific process itself) is an obvious example of cybernetic regulation. The practice of strategy management gives us a rich pattern for engineering new, cybernetic systems for management control, systems comprised of relative improvement contracts that empower managers to think as well as do. Please refer again to Exhibits 1 and 3. In the sections that follow, we explore how strategy management satisfies Weiner's criteria of communication, feedback, and automatic control.

Communication

The first criterion of cybernetic control is communication. In normally decentralized (i.e., divisionalized) organizations like GM, it may have been enough to tell the people what to do (through the budgeting process) and then to hold them accountable (through performance reviews and internal audits). In the radically decentralized organization of today, leaders must communicate what to think about as well — and trust managers to regulate themselves. There are two distinctive features of communication in the system of strategy management: systematic or companywide deployment and a balanced scorecard of results and means. Through companywide deployment, all decision-makers are aligned in solving the organization's strategic problems.

WHY SHED ACCOUNTING?

Why are we talking about the need for such drastic changes in management accounting? To put it succinctly, MBR does not support what Hope and Fraser refer to as radical decentralization. In any decentralized organization, "responsibility for strategic thinking and decision making" has been shifted "from the center to people closer to the customer."[7] Decentralization is good because it increases the speed of organizational decision-making — much the same way that parallel processing increases the speed of modern computers — by 35 percent or more.[8] But when does decentralization become radical? Radical compared to what? What is normal decentralization? And why is radical decentralization such a problem that we cannot deal with it by resorting to normal accounting systems?

Modern business was first decentralized in about 1919, when General Motors (GM) was reorganized into the familiar divisions of Chevrolet, Buick, and Cadillac, among others. Strategic thinking and decision-making was shifted from the chief executive's purview to divisional presidents.[9] By the 1970s, GM's divisionalized structure had become a global norm.[10] Thus, we will use GM — prior to its bankruptcy in 2009 — as the benchmark for normal decentralization. To build on our computer analogy, in its degree of decentralization, GM was comparable to an off-the-shelf laptop computer today, which has roughly four to eight information processing cores. In organizations such as Toyota, responsibility for strategic thinking and decision-making has been shifted as close as possible to the customer. At Toyota, machine operators on the shop floor are empowered to pause or even stop production when problems arise. This is radical decentralization in action. Toyota has hundreds of thousands of cores. It is a massively parallel supercomputer.

But speed comes at a price, and that price grows with the number of empowered decision-makers. Just as parallel computer programming becomes progressively more complicated as we multiply the number of cores, as we multiply the number of decision-makers, organizational leaders face similar "programming" problems — in other words, problems of strategic thinking and decision-making. Such problems, known collectively as the "agency problem," arise because the natural human tendency is to mind one's own business. This leads managers to optimize their compensation rather than the organization's profits or share price.[11] To deal with the agency problem of normal decentralization, GM invented what eventually became MBR, including the budgeting process, internal audits, and the annual performance review.[12] For a while, MBR quite successfully addressed the agency problem, allowing GM and its imitators to dominate the globe. The number of empowered decision-makers in radically decentralized lean and agile organizations has grown exponentially as a function of the number of management tiers engaged in strategy management and the average staffing ratio. The problem of agency and the need for new forms of control were certain to reassert themselves.

The first feature of communication is the systematic or companywide deployment of results and means to middle managers and supervisors, as well as to divisional and other senior leaders. In Exhibit 4, we see a fully articulated deployment tree for a medium-size energy company in the Eurozone. Deployment has progressed from Tier 1, the organization, through its divisions at Tier 2, to value streams and major projects at Tier 3, and finally to processes, operations, and individual tasks at Tiers 4 and 5. At each tier of management control, we see an A3 document that represents a formal agreement between managers at each node of this radically decentralized information-processing structure. In this case, roughly 50 A3s were drafted, including A3s for supporting operations and special projects. A3s were then connected to specific quality and cost improvements in processes at Tier 4 and operations at Tier 5.[13]

The second feature of communication is the so-called balanced scorecard of results

EXHIBIT 4 Deployment Tree

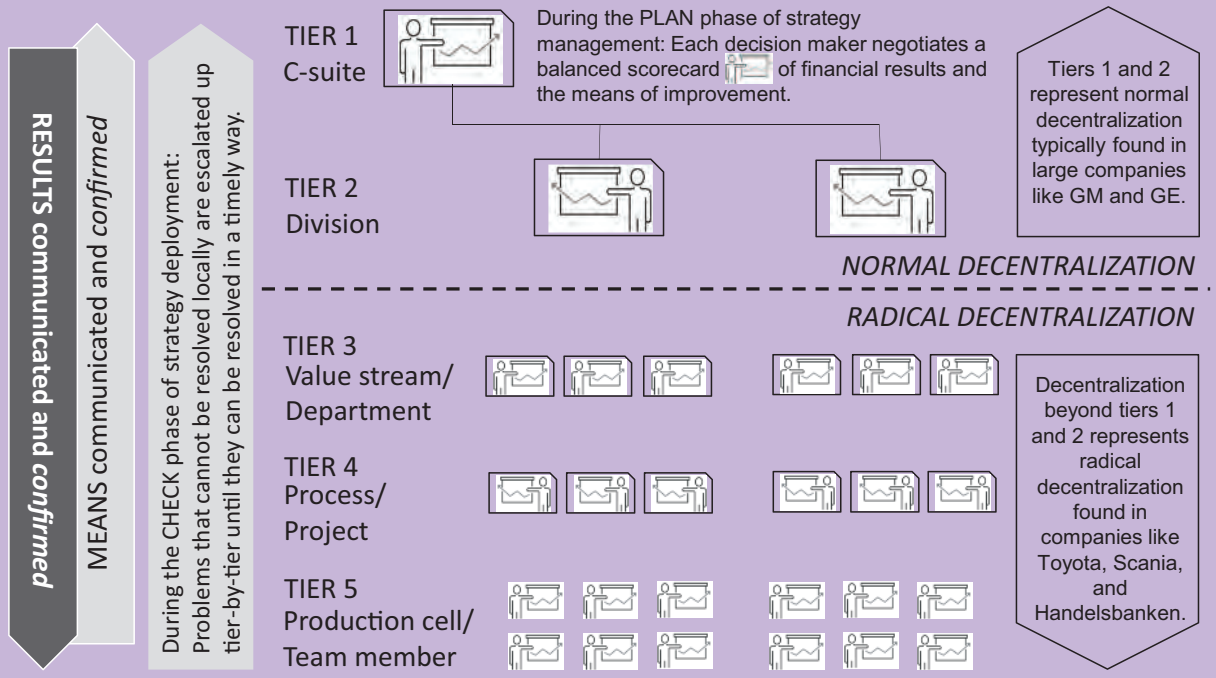


EXHIBIT 5 Cycles and Mechanisms of Feedback and Control

TIER	LEADERSHIP LEVEL	FREQUENCY	MECHANISM	
			SENSE	RESPONSE
1	C-suite	annually	Periodic reports + assurance audits	Improvement *kata*
2	Division	monthly		
3	Value stream/ Department	daily		
4	Process/ Project	hour by hour	Daily reports, visual cues, fail-safe devices	Automation, autonomation + improvement *kata*
5	Production cell/ Subteam/ Team member	cycle by cycle minute by minute task by task real time		

degree of autonomation

100% autonomation: human sense and response *minimized* but not eliminated

100% automation: human sense and response *eliminated*

and means. The Balanced Scorecard of Robert Kaplan and David Norton is in fact the result of an encounter with strategy management, which they observed in the late 1980s at Analog Devices. What they saw was a method that very consciously combined the refined financial targeting derived from Peter Drucker's management by objectives (MBO) and the equally refined targeting of process improvement derived from total quality management (TQM). Taken together, MBO and TQM gave rise to the four focal areas of their Balanced Scorecard, which include customer, process, growth (of people and technology), and, of course, finance. Each A3 in a deployment of strategy management contains this information. In effect, each manager in the system has a balanced scorecard of results and means. In each A3, a balanced scorecard expresses the strategic intent of the organization in increasingly stratified terms that are under the span of control of their respective process owners.[14]

Feedback

The second criterion of cybernetic control is feedback, or information about deviations from the targets for either results or means (see the sidebar entitled "Results Still Matter"). In a cybernetic management control system, all decision-makers must be informed by feedback. Strategy management provides mechanisms to process internal and external feedback by using the very same channels of communication established to deploy targets for both results and means (see Exhibit 4). These channels are used as a system for escalating deviations, defects, gaps, and other problems that cannot be solved readily within a manager's span of control. Within the system of strategy management, feedback has two distinctive features: the frequency of feedback cycles and the confirmation of messages through a process known as catchball.[15]

The first feature of strategy management's feedback system is the remarkable frequency of feedback cycles. In mechanical management control systems, such as MBR, managers must often wait for feedback until the annual performance review. In contrast, at each tier in the radically decentralized organization, in a process known as leader standard work, managers physically visit the workplace to give feedback on the processes under their respective spans of control (see Exhibit 5). At Tier 1, chief executives of very large organizations, such as Toyota, may visit each of their facilities once a year.[17] At Tier 2, vice presidents visit more frequently, perhaps monthly. At Tier 3, value stream managers and agile team leaders are scheduled to visit the production area weekly or even daily. At Tier 4, process owners who have multiple operations under their control may revisit the work daily. At Tier 5, supervisors revisit the work every hour or so. Also relevant at Tier 5, the final level of PDCA is the adherence to and continuous improvement of standard work by frontline workers on the one hand and the adherence to the project schedule by agile team members on the other hand. Operators and team members naturally revisit their

RESULTS STILL MATTER

Results still matter for Toyota. Not only are managers required to give account when they fall short of their financial targets, they are also required to explain when they overshoot. Any deviation from targets for either results or means, whether positive or negative, is considered to be a defect. It stands to reason that, under MBM, managers are twice as likely to be held accountable as under MBR. Ironically, this illustrates Johnson's point that MBM requires thinking to replace external, mechanical control. Toyota is equally interested in the "how," or causal mechanism of target achievement, and the "what," or the results themselves. Otherwise, it would not be able to remember how such results had been achieved.

TRUST BUT VERIFY

In the world of public accounting, the rise of the blockchain has elevated the possibility that the financial or external audit may soon be obsolete. In the radically decentralized organization, the internal audit may likewise be obsolete, at least as a form of control. The internal audit may nevertheless be useful as a form of assurance.[16]

EXHIBIT 6 The Improvement *Kata* of Leader Standard Work

A3*	Catchball questions contract negotiation		Review questions contract enforcement
Section 2	What is the proposed target condition?	Define/review and analyze expected financial *results* and other strategic objectives	What are we trying to achieve?
Section 1	What are the supporting facts?	Review and analyze historical data/information and empirical observations of current conditions	What is happening right now?
Section 3	What is your analysis of cause and effect?	Identify significant challenges, deviations, defects, gaps, and problems	What is getting in your way right now?
Section 4	What countermeasures do you propose to ensure good results?	Determine *means/methods* by which financial and other performance targets may be achieved	What do you propose to do *next?*
Section 5	What are the target achievement dates?	Establish/confirm the milestone dates by which means and results may be achieved	When can we expect to see results?
Section 5	What resources do you require?	Ensure sufficient human and material resources to execute the action plan	Do you require additional resources?

*The catchball and review questions that appear in this exhibit can be correlated to particular sections of the A3. Please see Exhibit 3.

work with the completion of each work cycle.[18]

The second feature of feedback is the confirmation of messages concerning the negotiation and review of results and means. Under MBR, targets are communicated in a top-down fashion with little or no feedback from the recipients of this information. In contrast, strategy management requires that all communications be two way. The process of communication is a method of negotiation and dialogue commonly known as catchball. Catchball follows a distinctive pattern that requires significantly more give and take than traditional budgeting. The pattern is known as the *improvement kata*. *Kata*, a term drawn from Asian martial arts, refers to a defensive or offensive pattern of response, often drawn from nature. In the context of strategy management, the pattern or *kata* ensures messages about results and their means are sent, received, and confirmed in a way that puts organizational learning ahead of short-term financial results. In Exhibit 6, the *kata* is broken down into open-ended coaching questions posed by managers to their direct reports at each tier of decision-making. The *kata* is used in both the plan phase of PDCA, to negotiate relative improvement contracts, and in the check phase, to investigate reasons why the means agreed upon in initial negotiations have failed to produce the expected results.[19]

Smart contracts and automatic/autonomatic control

The third criterion of cybernetic control is automatic control, adjustment triggered instantly by detecting deviations from the target condition. Under the terms of MBR's fixed performance contracts, the adjustment process is mechanical and painfully slow;

depending on the size and complexity of an organization, some processes may not be audited more frequently than once every five years (see the sidebar entitled "Trust but Verify"). Under the terms of MBM's relative improvement contracts, each decision-maker has the responsibility to check for or sense defects as they occur and the authority, based upon scientific evidence, to respond by adjusting the means without further management intervention. In this sense, control becomes automatic or *self*-control (more accurately termed "autonomatic" control in this instance — see the sidebar entitled "Automatic vs. Autonomatic Control").

As demonstrated in Exhibit 5, there are several mechanisms involved in "autonomatic" control. At Tiers 4 and 5, the most granular levels of management control, visual and audial cues, checklists, and fail-safe or "mistake-proofing" devices are embedded in processes and specific tasks and installed directly on machines where failures are likely to occur. Flashing lights and musical tunes alert operators to defects. Automatic detection can be coupled with automatic responses to quarantine defects. Automatic detection and correction of abnormal conditions can reduce the probability (even to zero) of defects occurring in the first place. Visual cues and fail-safe routines can also be installed in computer programs to help project managers, service providers, and administrators prevent and preclude defects in knowledge work. When problems cannot be resolved without assistance, production is paused or stopped, and problems are escalated tier-by-tier up the chain of command until the resources and expertise required to solve the problem can be organized. At Tiers 1–4, control systems become increasingly less mechanical or electrical — less automated and more automatic — but the improvement *kata*, which focuses on science and learning and eliminates blame from the process of investigation, can always be repeated.

Conclusion

In a quest for greater competitive advantage, first lean and now agile organizations have adopted radically decentralized decision-making structures. Radical decentralization promises faster organizational learning by effectively putting frontline managers and employees in charge and asking them to think. But legions of new decision-makers create new agency problems — that is, opportunities for self-dealing by managers, the agents of the organization, and its shareholders. As an effective system of management control, MBR — including the annual budgeting process, the fixed performance contract, and even the internal audit — is essentially obsolete. Not only are the command and the control of MBR slow to respectively detect and process feedback, but they severely limit the organization's adaptive responses. In place of MBR, lean and agile organizations adopt cybernetic systems of MBM. Those systems — at least those based on strategy management — are designed to guide and support as well as regulate management self-control. MBM replaces the machine of MBR's fixed performance contracts with a living network of relative

AUTOMATIC VS. AUTONOMATIC CONTROL

A3s are "smart" contracts, not unlike the smart contracts of the blockchain, which can be programmed to transfer funds instantaneously when the blockchain senses that contractual conditions have been met. Strictly speaking, A3s are not automated, because they are not connected mechanically or electronically to the organizational chain of command. Instead, we say they are autonomated or "automated with a human touch." Autonomation is a work design philosophy that embeds PDCA directly into manufacturing and project management workflows by means of visual cues, checklists, and electronic sensing devices and servomotors. When there is actionable feedback about a target condition, autonomation requires decision-makers to stop and think. Technically speaking, automatic control differs from autonomatic control in that the former does not involve human beings in the adjust cycle of PDCA. While full automation of check and act are always an option, most lean companies prefer to leave human beings in the PDCA loop, unless the work is particularly dirty, dangerous, or difficult.[20]

improvement contracts. In the A3, we find a perfect template for those contracts. The companywide deployment process of catchball ensures that MBM's communication — the negotiation and confirmation — of balanced scorecards of financial targets and process improvements to decision-makers is clear. In improvement *kata*, we find the means of feedback and autonomatic control — that is, automation with a human touch. That touch is the scientific method, PDCA, and a license to think inscribed on every A3. So, while organizations may "shed accounting" to become lean — or agile — they should seriously consider strategy management as an alternative. It provides a blueprint for the control system of the future, a system of cybernetic self-control and carefully regulated, scientific thinking. ■

NOTES

[1] Johnson, H.T., Lean accounting: To become lean, shed accounting, *Cost Management* 20, no. 1 (2006): 6–17; Johnson, H.T. and Bröms, A., *Profit Beyond Measure: Extraordinary Results Through Attention to Work and People*. (New York: The Free Press, 2000): 2.

[2] Under the heading "External Control," Johnson includes the internal audit of modern management accounting, which is conducted by management accountants as external agents, in the sense that they are not participants in the processes that they assess and control. Of course, the external, financial audit of public accounting is external in the same sense. In the shift toward lean and agile processes, however, the role of management accountants is changing. See, for example, Cunningham, J., *The Value Add Accountant: An Indispensable Partner Supporting Strategic Improvement Efforts*. (Evanston, IL: JCC Press, 2018).

[3] Hope, J. and Fraser, R., Who needs budgets? *Harvard Business Review* (Feb 2003): 2–8; Hope, J. and Fraser, R., *Beyond Budgeting: How Managers Can Break Free from the Annual Performance Trap* (Boston: Harvard Business School Press, 2003): 26–29. Although Hope and Fraser's research focused on Europe and the United Kingdom, by my reckoning, the relative improvement contract first emerged as a formal document in Japan in the late 1970s. See Shook, J. and Yoshino, I., How the A3 came to be Toyota's go-to management process for knowledge work, *The Lean Post* (Aug 2, 2016). Available at: https://lean.org/leanpost/Posting.cfm?LeanPostId=615. Japanese adopters of TQM and strategy management may have begun to go beyond budgeting in the 1950s and 1960s, long before 1970, when Hope and Fraser's paragon, Handelsbanken, abandoned the budgeting process. See Akao, Y. (Ed.), *Hoshin Kanri: Policy Deployment and Successful TQM*. (New York: Productivity Press, 1991): 192. Economists maintain that the fundamental unit of analysis of organizational structure is the contract. See Williamson, O.E., *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. (New York: The Free Press, 1985): 43–84. Naturally enough, economists see organizations as a nexus or bundle of contracts. See Jensen, M.C. and Meckling, W.H., Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics* 3, no. 4 (1976): 305–360. These are contracts, essentially, to solve problems and achieve targets.

[4] Shook, J., Toyota's secret report, *Sloan Management Review* 50, no. 4 (2009): 30–33; Shook, J., *Managing to Learn: Using the A3 Management Process to Solve Problems, Gain Agreement, Mentor and Lead*. (Cambridge, MA: Lean Enterprise Institute, 2008). Regarding the system of strategy management, refer to Akao (*op. cit.* note 3 Akao). The Japanese character for *hoshin* represents a compass and refers to direction or strategy. The character for *kanri* stands for management or control, in the sense of quality control. *Hoshin kanri*, or strategy management, was invented in Japan in the 1950s in response to the Union of Japanese Scientists and Engineers' (JUSE) inclusion of a "quality policy" criterion in the Deming Prize. The first published book that explained how the A3 is used to deploy and execute strategy was Jackson, T.L., *Hoshin Kanri for the Lean Enterprise: Developing Competitive Capabilities and Managing Profit*. (New York: Productivity Press, 2006). See also Jackson, T.L., *Implementing a Lean Management System*. (Portland, OR: Productivity Press, 1996).

[5] *Op. cit.* note 4 *Hoshin Kanri*, Introduction and Chapter 4 ("Design the Annual *Hoshin*").

[6] Weiner, N., *Cybernetics: Or Control and Communication in the Animal and the Machine*. 2nd ed. (Cambridge, MA: The MIT Press, 1961): 6–12.

[7] *Op. cit.* note 3 *Beyond Budgeting,* p. 119.

[8] Wheatley, M., Goodbye, command and control, *Leader to Leader* 5 (Summer 1997): 21–28. Toyota is famous for collapsing production lead times by more than 90 percent and development and administrative lead times by more than 50 percent, results I have replicated myself many times as a lean consultant for manufacturing, health care, and other industries.

[9] Chandler Jr., A.D., *Strategy and Structure: Chapters in the History of American Industrial Enterprise*. (Cambridge, MA: The MIT Press, 1962).

[10] Servan-Schreiber, J.-J., *The American Challenge*. (New York: Atheneum, 1968).

[11] The agency problem is compounded by inherent biases and a lamentable tendency to hide information from others. *Op. cit.* note 3 Williamson, pp. 279–283.

[12] Johnson, H.T. and Kaplan, R.S., *Relevance Lost: The Rise and Fall of Management Accounting*. (Boston, MA: Harvard Business School Press, 1987): 93–123; cf. note 3 *Beyond Budgeting*, pp. 9–15.

[13] Technically speaking, only managers (including supervisors and team leaders) write A3s. At Tier 5, strategy management relies on a different type of documentation known as visual management, in which the same balanced scorecard of targets for improvements as well as results are recorded and tracked. *Op. cit.* note 3 *Hoshin Kanri,* Chapters 5 ("Align the Organization Through Catchball"), 6 ("Create a Lean-Thinking Environment"), and 9 ("Institutionalizing *Hoshin Kanri* Through Standardized Work, *Kaizen* and Leadership Development").

[14] Kaplan, R.S. and Norton, D.P., *The Balanced Scorecard: Translating Strategy into Action*. (Cambridge, MA: Harvard, 1996): vii; Kaplan, R.S. and Norton, D.P., The Balanced Scorecard—Measures that drive performance, *Harvard Business Review* (Jan–Feb 1992): 71–79; Kaplan, R.S., "Analog devices: The half-life metric," Harvard Business School Case 190-061, March 1990 (revised June 1993).

[15] *Op. cit.* note 3 *Hoshin Kanri,* Chapter 5.

[16] Concerning the future of financial audits, see "Blockchain technology: A game-changer in accounting?" Deloitte (March 2016). Available at: https://www2.deloitte.com/de/de/pages/innovation/topics/blockchain.html. For an illustration of how Toyota's production system performs the function of an internal audit more or less in real time, see Jackson, T.L., Decoding value at the source: The ABCs of lean production metrics, *Cost Management* 32, no. 4 (2018): 31–42.

[17] The annual visit of the top executive is known as the president's diagnosis, a method that is the foundation of most quality and productivity prizes. See Jackson, T.L., *Corporate Diagnosis: Setting the Global Standard for Excellence*. (New York: Productivity Press, 1996).

[18] The seminal contribution on leader standard work is Mann, D., *Creating a Lean Culture: Tools to Sustain Lean Conversions*. 3rd ed. (Boca Raton, FL: CRC Press, 2015). For a detailed exploration of daily management at Tiers 4 and 5 and its relationship to strategy management, see Galgano, A., *Companywide Quality Management*. (New York: Productivity Press, 1994): 271–320.

[19] Rother, M., *Toyota Kata: Managing People for Improvement, Adaptiveness, and Superior Results*. (New York: McGraw Hill, 2009). The coaching questions of the improvement *kata* are deeply rooted in strategy management. *Ibid*. Galgano, pp. 353–360.

[20] Shingo, S. (translated by Dillon, A.P.), *A Study of the Toyota Production System from an Industrial Engineering Viewpoint*. (New York: Productivity Press, 1989): 57–60. The principle method of implementing autonomation is *poka-yoke* or mistake-proofing. See Shingo, S. (translated by Dillon, A.P.), *Zero Quality Control: Source Inspection and the Poka-Yoke System*. (Portland, OR: Productivity Press, 1986).