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Using value-stream maps to improve leadership

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Abstract *Presents for the first time how value-stream maps can be used to determine leadership beliefs, behaviors, and competencies. Current-state value-stream maps represent "conventional" management thinking and practices – what most business schools teach – while future-state maps represent progressive "lean" management thinking and practices rooted in the Toyota management system. Current- and future-state value-stream maps for manufacturing and service business processes are used to illustrate the progression from belief to behavior to competency. The beliefs, behaviors, and competencies of leaders skilled in these two modes of management thinking and practice are shown to be remarkably different, and constitute an alternative and simpler route for identifying leadership problems and improving leadership effectiveness.*

Introduction

Value-stream maps, originally called "material and information flow maps," are one-page diagrams depicting the process used to make a product (Womack and Jones, 1996; Rother and Shook, 1999). They were first developed by the Operations Management Consulting Division of Toyota Motor Corporation, Toyota City, Japan, in the late 1980s (Shook, 2003). Value-stream maps identify ways to get material and information to flow without interruption (Womack and Jones, 1996), improve productivity and competitiveness, and help people implement system rather than isolated process improvements. For over ten years, value-stream maps were applied principally to manufacturing activities.

More recently, however, value-stream maps have been used to understand the flow of material and information in office activities (Tapping and Shuker, 2003; Swank, 2003) such as order entry, new product development, and financial reporting. Indeed, they can be used to map any service business process, including business-to-business sales, retail sales, e-business, auditing, healthcare, education, and government services.

Value-stream maps help people see waste that exists in business processes, where waste is defined as an activity (Ohno, 1988) or behavior (Emiliani, 1998) that adds cost but does not add value. Eliminating waste focuses people's efforts on the value creating activities that customers desire and are willing to pay for, and results in improved business processes -, e.g. shorter lead-times, fewer defects and errors, and lower costs (Emiliani *et al.*, 2003; Swank, 2003). The classic seven wastes (Ohno, 1988), and an eighth waste more recently identified (Emiliani, 1998), are:

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(1) Overproduction: making more products than can be sold.
(2) Waiting: operators or machines waiting.
(3) Transportation: transporting parts.
(4) Processing: processing itself.
(5) Inventories: raw material, work-in-process, and finished goods.
(6) Moving: operator and machine movement.
(7) Defects: making defective products.
(8) Behaviors: behaviors that do not add value.

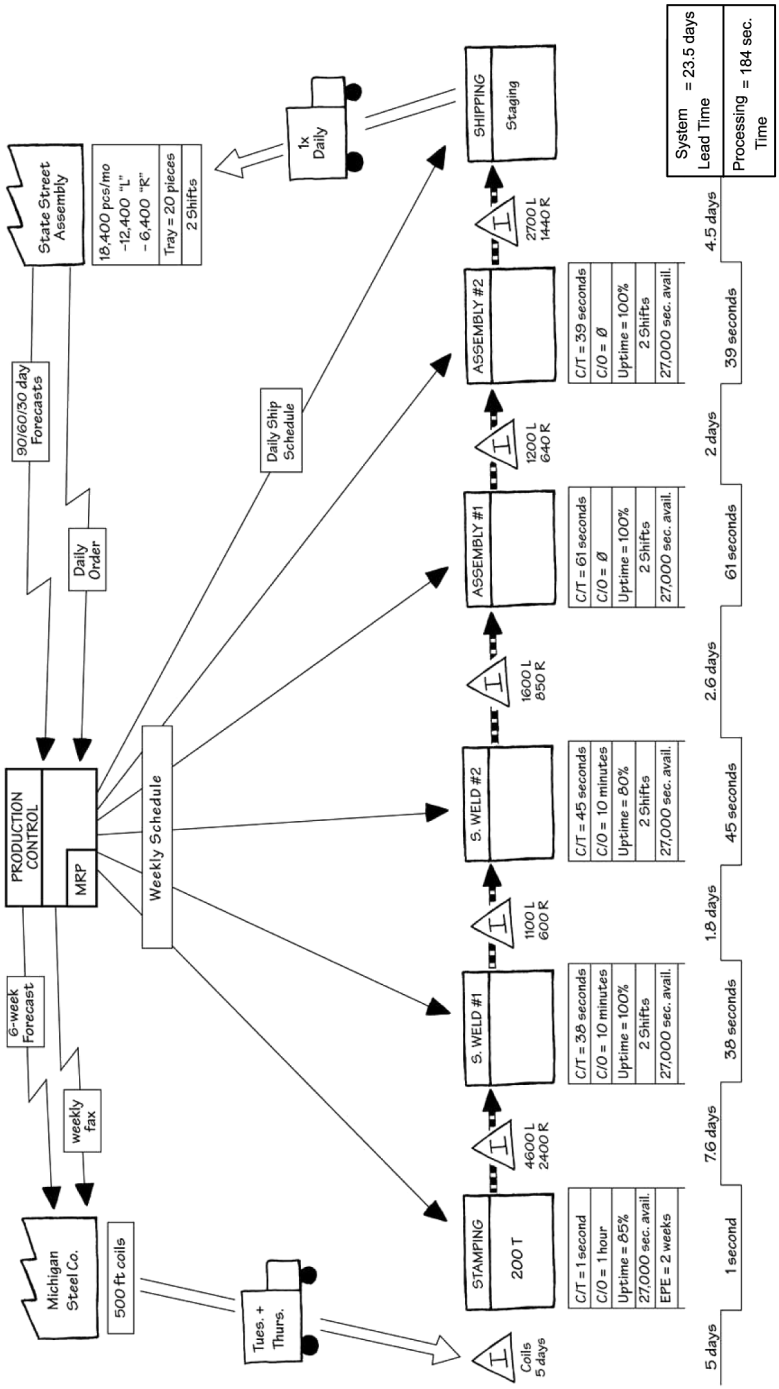
The same eight wastes exist in service businesses:

(1) Overproduction: doing work not requested by customers.
(2) Waiting: reviews and approvals.
(3) Transportation: transporting documents.
(4) Processing: processing itself.
(5) Inventories: data, work-in-process, and completed services.
(6) Moving: searching for information.
(7) Defects: errors in data or documents.
(8) Behaviors: behaviors that do not add value.

Value-stream maps are created by cross-functional teams of people who are directly involved in the process under consideration. There are two types of value-stream maps: "current state," shown in Figures 1 and 2, and "future state," shown in Figures 3 and 4. Figures 5 and 6 show some of the icons used to create value-stream maps. As the name implies, "current-state" value-stream maps depict the current way in which material and information are processed. Importantly, until a current-state map is drawn, people – including senior managers – are unaware of the large amount of waste that exists in a process as well as the existence of confusing information signals.

Senior managers often say or think, "We are not globally competitive," and usually attribute this to high labor costs (McDermott, 2002). Current-state value-stream maps show senior managers, in vivid detail, that the reasons for poor competitiveness are instead due to an abundance of the first seven types of waste listed above. While the current state was created by well-intentioned people at all levels of the organization trying to get work done the best way they know how, given the circumstances, it ultimately reflects a situation that maximizes the consumption of resources – human, financial, time, space, equipment, etc. It is therefore not surprising that many senior managers say, "We are not globally competitive."

Future-state value-stream maps depict a future condition that incorporates yet-to-be-made improvements. Team members, usually with the help of an experienced facilitator, identify the improvements by questioning current paradigms and thinking creatively about how to improve the process. Sometimes an "ideal state" value-stream map will be drawn to guide additional future continuous improvement activities. The team then presents the value-stream maps to senior management for review and approval.



Note: C/T = cycle time; C/O = change-over time; EPE = every part every ____

Source: Womack (2003)

Figure 1.
Current-state value-stream map showing the process for producing stamped and welded metal brackets

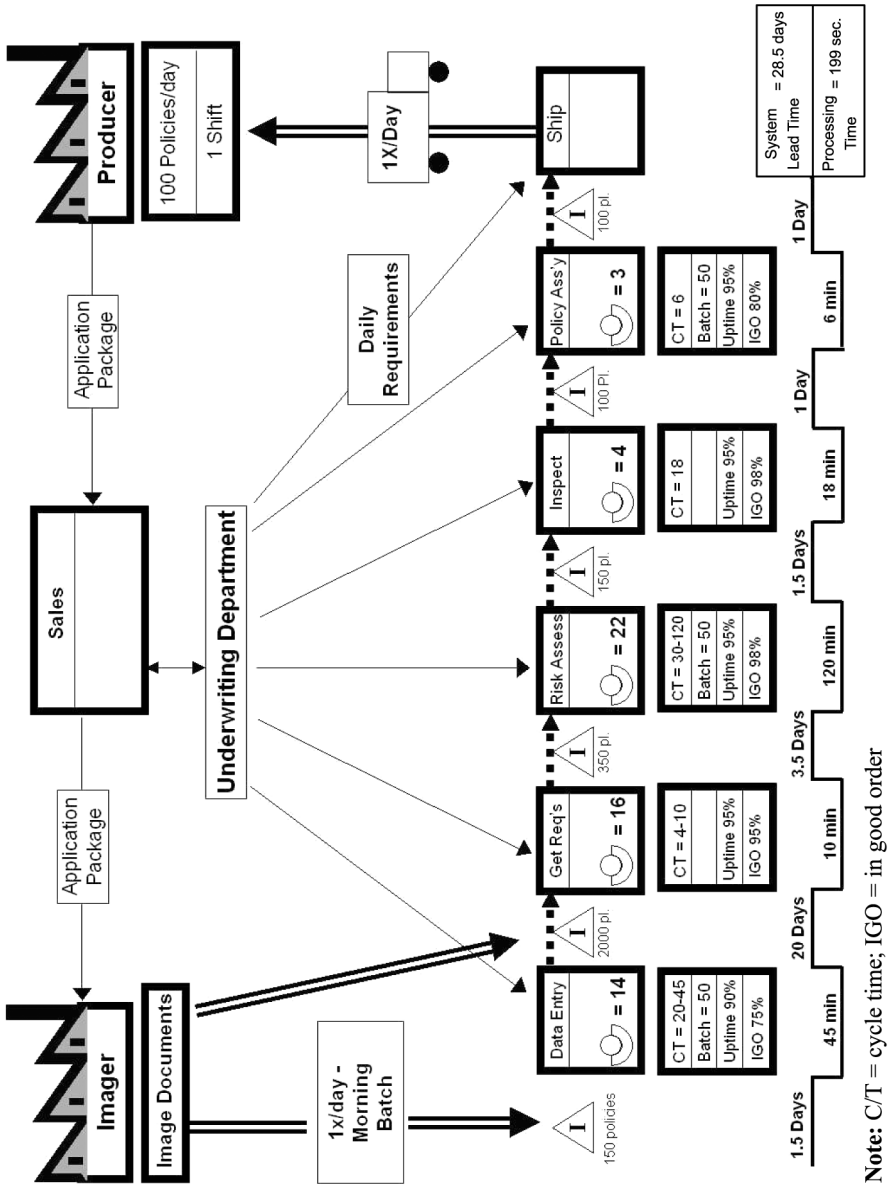
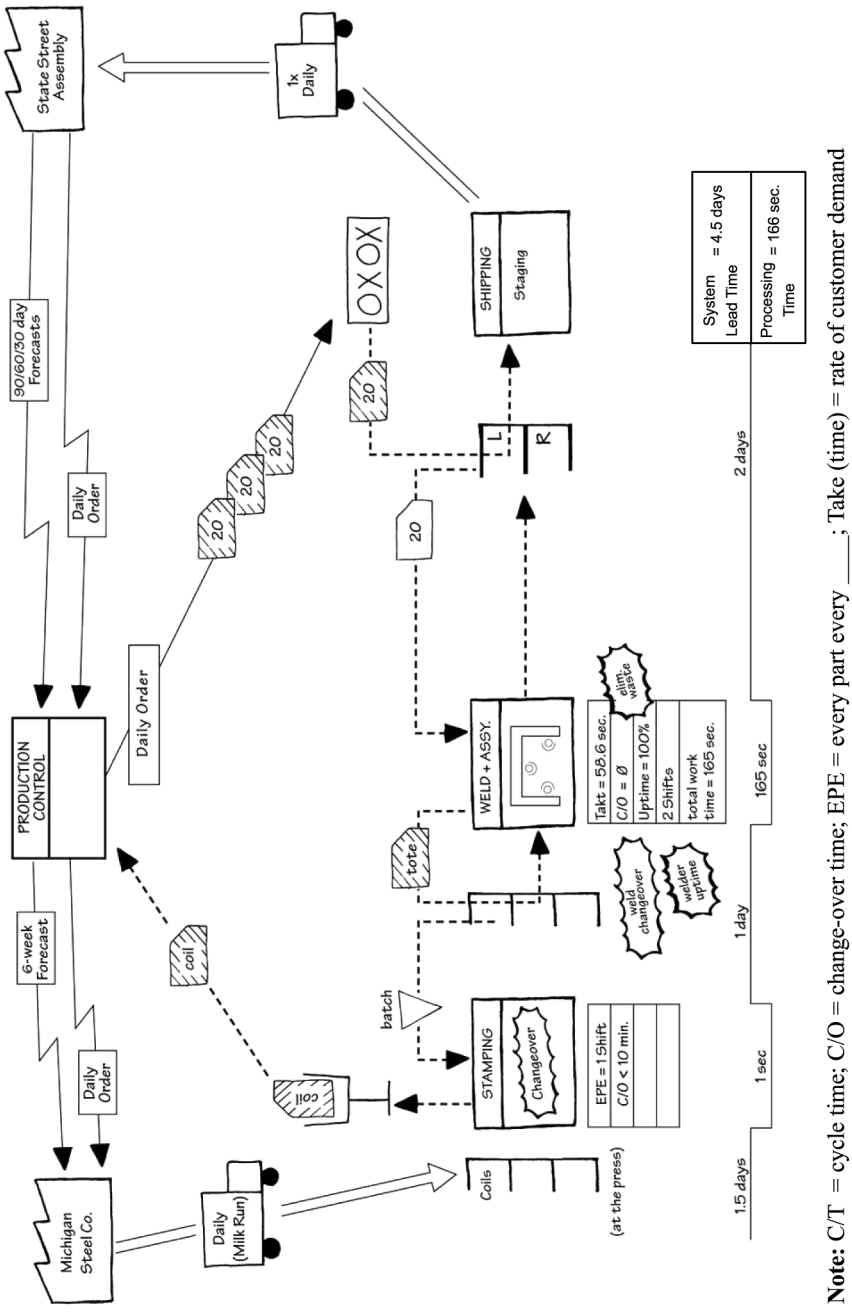


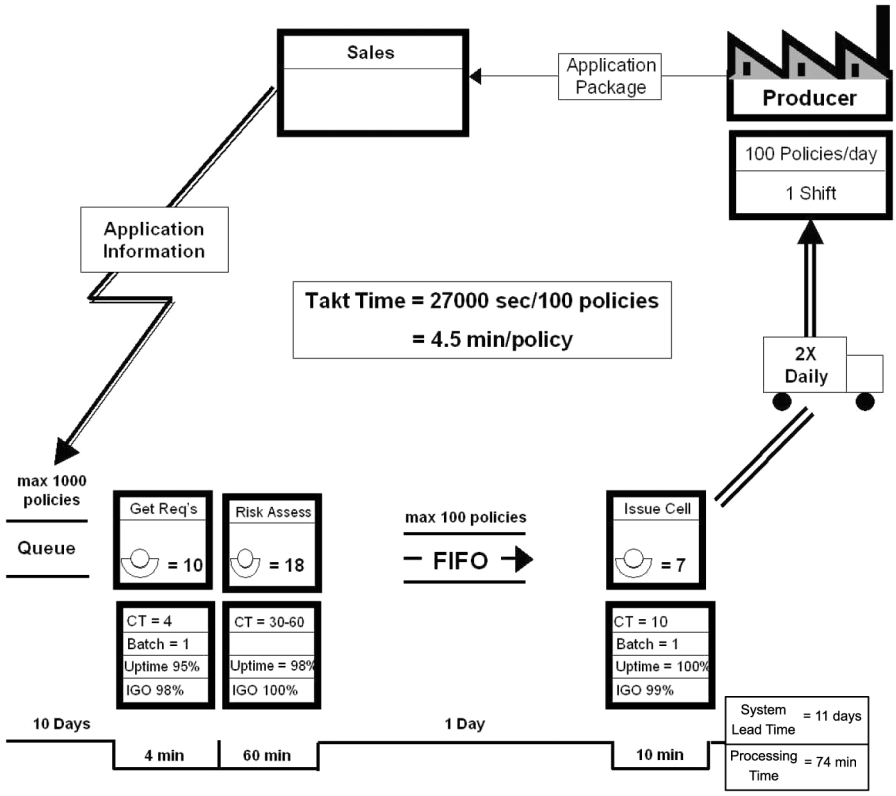
Figure 2.
Current-state value-stream map showing the process for producing an insurance policy



Note: C/T = cycle time; C/O = change-over time; EPE = every part every ____; Take (time) = rate of customer demand

Source: Womack (2003)

Figure 3.
Future-state value-stream map showing the process for producing stamped and welded metal brackets



Note: C/T = cycle time; IGO = in good order

Figure 4.
Future-state value-stream map showing the process for producing an insurance policy

In some cases, however, the team is not allowed to implement the future state because it requires simultaneous changes in several functional areas – changes that some members of the senior management team may be unwilling to make. This can be due to several factors, such as unwillingness to change, unfamiliarity with this improvement methodology, or incorrect perceptions that the proposed improvements will cost too much money or take too much time to implement. Thus, some senior managers will prefer traditional methods for meeting financial and non-financial objectives (Emiliani, 2000). Despite this occasional negative outcome, the use of value-stream maps has become very popular in the last six years. Many companies, both large and small, see them as a useful tool for guiding efforts to improve national or international competitiveness.

The use of value-stream maps has been extended to the field of accounting to determine the process costs of a value stream. The information contained in value-stream maps can be used to calculate current- and future-state process costs and create value-stream profit-and-loss statements (Maskell, 2001; LEI, 2003a; Maskell and Baggaley, 2003). This is a significant break from traditional cost accounting methods, and one that more accurately reflects the costs associated with production and non-production activities. Value-stream maps have also been used to determine the

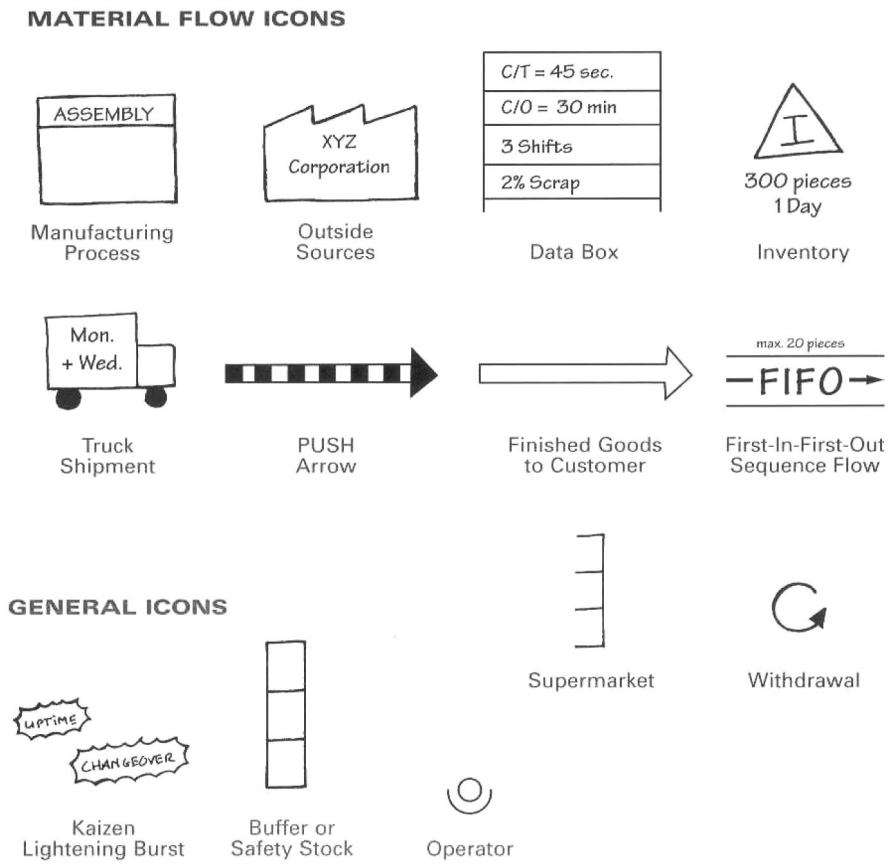


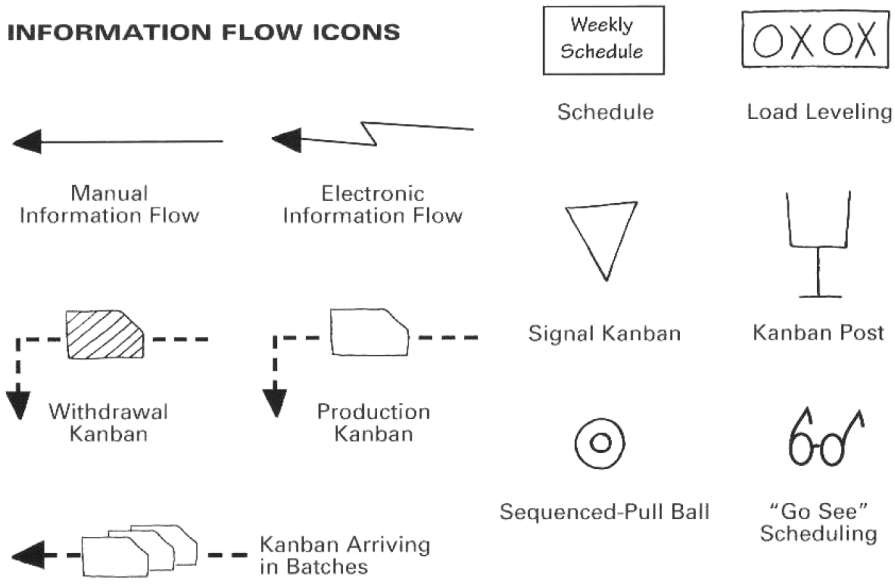
Figure 5.
Value-stream map: material-flow icons

Source: Rother and Shook (1999)

amount of CO_2 greenhouse gas generated by processing and transportation (Simons and Mason, 2003).

This paper further extends the use of value-stream maps to the field of leadership and organizational improvement. It uses value-stream maps to determine the beliefs, behaviors, and competencies of senior managers that support the current state, and compares them to senior managers that implement the future state. Importantly, value-stream maps can also be used to elucidate and characterize the existence of the eighth waste, behavioral waste, which is powerful in its ability to block the flow of information between key stakeholders such as employees, suppliers, customers, investors, and communities (Emiliani, 1998, 2000, 2003; Emiliani *et al.*, 2003).

This work contributes to the literature by presenting a novel route for identifying leadership problems and improving leadership effectiveness, as well as day-to-day management – independent of traditional leadership competency models (Lucia and Lepsinger, 1999; Cooper, 2000; Emiliani, 2003) or training programs rooted in complex industrial psychology or organizational behavior theories (Argyris, 1990; Goleman,



Source: Rother and Shook (1999)

Figure 6.
Value-stream map: information-flow icons

1998, Boyatzis *et al.*, 2002) – and is a useful method for recognizing and understanding the progression from leadership beliefs to behaviors to competencies.

Batch-and-queue compared to lean

Complete descriptions of conventional and lean management principles and practices have been presented in detail elsewhere (Monden, 1993, 1998; Womack and Jones, 1996; Fujimoto, 1999; Emiliani, 2000, 2003; Emiliani *et al.*, 2003). In a nutshell, most businesses, whether service or manufacturing, public or private, profit or non-profit, process materials and information according to conventional or "batch-and-queue" (B&Q) practices, i.e. processing large batches, which result in long queue times between operations. This has many serious deficiencies including (Womack and Jones, 1996; Bowen and Youngdahl, 1998; Goland *et al.*, 1998; Brady, 2000; Barron, 2000; Emiliani, 2000, 2004):

- long lead-times;
- low quality;
- high costs;
- low productivity;
- customer dissatisfaction; and
- conflict between stakeholders.

In addition, businesses that operate using conventional management practices typically focus on results, with little or no attention given to the processes that were

used to achieve the results. This means that good results are unlikely to be repeated, while poor results are likely to be encountered periodically. There is also an intense focus on local optimization, including the use of business metrics that may drive improvement in one area at the expense of other departments or metrics, which results in conflict between people as well as business objectives (Emiliani *et al.*, 2003).

Leaders support batch-and-queue material and information processing, despite many serious shortcomings, because they believe it is efficient or have been trained that way on-the-job or in school. In addition, there are usually financial and other long-established systems or practices in place that support batch-and-queue material and information processing.

A small but growing number of companies practice a different type of management, one rooted in the principles and practices of Toyota Motor Corporation's management system (Ohno, 1988; Womack *et al.*, 1990; Monden, 1993; Womack and Jones, 1996; Imai, 1997; Monden, 1998; Basu, 1999; Fujimoto, 1999; Emiliani *et al.*, 2003). At its core, the lean management system is focused on eliminating waste (called *muda* in Japanese), creating value for end-use customers, and getting material and information to flow without interruption. In other words, they view batch-and-queue processing, related metrics, and organizational routines as defective because they result in high costs, low quality, long lead-times, and slow response to changing customer needs.

Lean businesses have characteristics that are mostly the opposite of that found in conventionally managed businesses (Emiliani *et al.*, 2003). Material and information that flows has many benefits including (Nishiguchi, 1994; Womack and Jones, 1996; Fujimoto, 1999; Dyer and Nobeoka, 2000; Emiliani *et al.*, 2003):

- short lead-times;
- high quality;
- low cost;
- high productivity;
- superior financial and non-financial performance;
- improved time-based competitiveness;
- customer satisfaction;
- balance of stakeholders' interests; and
- conflict reduced or eliminated.

Lean businesses focus on the processes used by people to perform an activity, and separate value-added work from non-value added but necessary work and waste (Ohno, 1988). This helps ensure that favorable results can be easily repeated. If unfavorable results are encountered, then teams work to quickly discover the root cause of problems and apply countermeasures. The lean management system also focuses on improving the entire business system, rather than optimizing individual parts of the business. If an improvement is good only for one functional area but not good for the entire company or its customers, then the improvement is not undertaken (Toyota, 2001).

These and other factors result in favorable intra- and inter-organizational capability building – features largely absent in batch-and-queue businesses (Nishiguchi, 1994; Fujimoto, 1999; Dyer and Nobeoka, 2000; Emiliani *et al.*, 2003). Companies that practice

lean management well are formidable competitors in good economic times and usually outperform peer group companies in difficult economic times (Emiliani *et al.*, 2003).

Both batch-and-queue and lean management practices require leaders to believe in certain things. These beliefs drive behaviors that, over time, result in leadership competencies (Emiliani, 2003), i.e. specific skills, knowledge, or characteristics needed to perform a role effectively and to help a business meet its strategic objectives (Lucia and Lepsinger, 1999). However, while the context is normally positive, competencies may also be negative in nature and have been characterized as resulting in "skilled incompetence" (Argyris, 1986). Thus, a leader can possess "good" competencies or "bad" competencies – i.e. being good at doing things that result in bad outcomes (Emiliani, 2003).

Value-stream maps

Figure 1 shows the current-state value-stream map for a company producing stamped and welded metal brackets in left-hand and right-hand configurations. It includes the following information:

- customer requirements communicated electronically as 90/60/30 day forecasts and daily orders;
- production control calculates weekly requirements using material requirements planning (MRP) software system and delivers a print-out of schedule to each process;
- steel coil requirements communicated to supplier via weekly fax;
- steel coils delivered twice per week by supplier to meet five-day supply requirement;
- five discrete processing steps (stamping + 2weld + 2 assembly) are used to produce brackets;
- stamping machine change-over time = 1 hour;
- each operation produces uncontrolled quantities of work-in-process independent of one another due to multi-point scheduling;
- average machine uptime = 93 percent;
- completed brackets are shipped to the customer once per day;
- system lead-time = 23.5 days; and
- processing time = 184 seconds.

Among the most telling pieces of data is the long lead-time and short processing time. If every company in the metal bracket business has similar lead-times, and customers are indifferent to lead-time, then there is no reason to improve this measure despite the existence of waste. However, if competitive pressure exists to reduce lead-times, then the company depicted in the current-state value-stream map will have difficulty competing on that basis, and invariably suffer from high costs and poor quality as well.

Figure 3 shows the future-state value-stream map. It includes the following information:

- customer requirements communicated electronically as 90/60/30 day forecasts and daily orders;
- production control issues daily orders to shipping department using inexpensive *kanban* (i.e. work instruction) card system (Lu, 1989);
- steel coil requirements communicated to supplier daily via computer;
- steel coil delivered daily by supplier to a "supermarket" (i.e. controlled inventory used to schedule work at an upstream process (LEI, 2003b));
- two discrete processing steps: one stamping operation with machine change-over
- time < 10 minutes (Shingo, 1985), and combined welding and assembly operations;
- quantity of brackets produced limited to the size of the supermarkets;
- average machine uptime = 100 percent;
- completed brackets are shipped to the customer once per day;
- system lead-time = 4.5 days; and
- processing time = 166 seconds.

In this case, there is a large reduction in stamping machine change-over time and also the elimination of several queues by combining operations, which enables a much shorter system lead-time of 4.5 days (80 percent reduction). Operations have been combined resulting in 10 percent reduction in processing time, production is coordinated through the use of controlled inventories, and information is conveyed using simple *kanban* cards. The future state obviously represents a much more competitive position that the business and its customers will enjoy if leaders support implementation of the future state. In addition, it offers valuable new learning opportunities to both leaders and associates.

Figure 2 shows the current-state value-stream map for a company producing an insurance policy. It contains the following information:

- application documents pass from producer (i.e. insurance agent) to the insurer's sales department and then to an imaging company that scans the documents;
- imaged documents are electronically delivered once per day in the morning as a batch;
- five discrete steps (four processing and one inspection) are used to produce insurance policies;
- each process produces work independent of one another, dictated by multiple schedules communicated to each process by the underwriting department;
- uncontrolled amounts of work-in-process exist throughout the system, contributing to long and unstable queue times; processes are performed in batches of 50 units;
- 59 workers are needed to produce policies in this system;
- first pass yield = 55 percent (FPY is the product of each process' "in good order" (IGO) percent; i.e. FPY = 75 percent $\times$ 95 percent $\times$ 98 percent $\times$ 98 percent $\times$ 80 percent);
- average uptime of information systems = 94 percent;

- completed policies are shipped to producers once per day;
- system lead-time = 28.5 days; and
- maximum processing time = 199 minutes.

There are many similarities between the current-state value-stream map for producing an insurance policy and that shown in Figure 1 for producing a bracket. Long lead-times versus actual processing times, uncontrolled work-in-process, multiple scheduling points, and "push" processing are among the similarities. The current-state system design does not support a business strategy that competes on the basis of time, nor would it be a low cost design as costs would be higher due to the inherent complexity of the system.

Figure 3 shows the future-state value-stream map. It includes the following information:

- Application documents pass from producer to sales who then electronically inputs data directly into the queue for first process.
- Three discrete processing steps are used to process the application and generate an insurance policy. Previous discrete operations have been combined into work cells where work units are continuously flowed through the process area.
- Each process produces work in a first-in-first-out (FIFO) sequence once application packages are ready for processing. Single-unit flow processing (batch = 1) is employed.
- Controlled amounts of work-in-process exist in two locations in the system yielding a stable maximum system lead-time.
- 35 workers are needed to produce policies[1].
- First pass yield = 97 percent.
- Average uptime of information systems = 97.6 percent.
- Completed policies are shipped to producers twice per day.
- The demand rate (takt time) for policies is 4.5 minutes per policy.
- System lead-time = 11 days.
- Maximum processing time = 74 minutes.

Once again, there are many similarities between the future-state value-stream map for producing an insurance policy and that shown in Figure 3 for producing a bracket. Shorter lead-times and processing times, controlled work-in-process, a single scheduling point, and "pull" processing are among the similarities. The future-state system design now supports a business strategy that can compete on the basis of time, and will be a lower cost design higher due to simplification of the production system.

Beliefs, behaviors, and competencies

The beliefs, behaviors, and competencies exhibited by leaders ultimately manifest themselves in the ways that people at all levels in a business go about doing tasks and interacting with each other (Emiliani, 2003). Current-state value-stream maps reflect what people have been allowed to do, or not do, over time, and represent leadership's – and by extension, an organizations' – collective current best practice for satisfying customer requirements.

The current-state value-stream maps shown in Figures 1 and 2 depict a situation in which leaders believe that certain aspects of business either can not be changed or are too difficult to change, and thus not worth any effort – physical or mental – to challenge. They also typically believe that their business is complex, and thus complex systems are needed to support their products. However, there is a great deal of inefficiency and waste in the current system that left unrecognized and unchanged will inhibit overall system improvement.

Repetitive errors that people encounter are considered to be a normal part of everyday business, and the root causes of systemic problems go undetected. While people learn how to respond and improve within the context and constraints of the current state, there is no change in the underlying beliefs that would help drive people to change how they go about doing their day-to-day activities (Argyris, 2002). So when competitiveness wanes, leaders often quickly turn to outsourcing work as the solution – despite the fact they have not recognized the existence of waste or understand that the value-added portion of work is small.

Tables I and II show several beliefs that are immediately apparent from looking at the current-state value-stream maps shown in Figures 1 and 2, respectively, as well as related behaviors and competencies. These are not intended to be a comprehensive account of all operative beliefs, behaviors, and competencies among leaders responsible for the current state. Rather, they simply illustrate some of the obvious beliefs that are in play, which in turn lead to behaviors and competencies that form the basis of important future management decisions such as layoffs, plant closings, squeezing suppliers' profit margins, or outsourcing work. Additional beliefs, behaviors, and competencies exhibited by leaders skilled in conventional and lean management practice have been previously described (Emiliani, 2003).

The beliefs shown in Tables I and II result in three consistent leadership behaviors:

(1) don't question the process;

(2) ignore improvement opportunities; and

(3) encourage local process efficiencies.

If the leader does not question the process and ignores improvement opportunities, then followers are not likely to do so either. Instead they will, in most cases, prefer to avoid taking unnecessary personal or business risk. Hence the adage: "we park our brains at the door" when coming to work. Competencies such as "maintain the status quo" and "increase costs" erode competitiveness over time, causing leaders to seek unimaginative unilateral solutions to regain competitiveness such as layoffs, plant closings, squeezing suppliers' profit margins, or outsourcing work (Emiliani, 2000; Mintzberg *et al.*, 2002).

The competencies that result from these beliefs and behaviors are the opposite of that which sound business judgment or articulated business objectives would support. Senior managers must recognize that fundamental beliefs and practices drive dysfunctional behaviors and competencies. Without a change at this level, leadership behaviors and business practices are unlikely to result in favorable outcomes.

Further, current-state beliefs disable communication and the development of intra- and inter-organizational learning routines that could help improve competitiveness. Importantly, the beliefs exhibited result in wasteful leadership behaviors (Emiliani, 1998) and competencies that impede the flow of information between people (Emiliani,

Belief: something accepted as true	→	Behavior: conduct based upon beliefs	→	Competency: an established skill or capability
Many processing steps are needed Add additional steps if needed		Don't question the process Ignore improvement opportunities		Maintain the status quo Increase costs (current labor, material, space, and equipment expenses and future liabilities, e.g. pensions and healthcare) Increase lead-times
Two welding and two assembly operations are needed		Don't question the process Ignore improvement opportunities		Maintain the status quo Employ more people than are actually needed (i.e. over-hire) Increase costs (current labor, space, and equipment expenses and future liabilities, e.g. pensions and healthcare)
Need two shifts to meet customer demand		Don't question the process Ignore improvement opportunities		Maintain the status quo Over-hire Increase costs (current labor, space, and equipment expenses and future liabilities, e.g. pensions and healthcare)
Production control determines what to make, how much to make, when to make it		Don't question the process Communicate requirements to people at every operation		Cause confusion over what do make, how much to make, when to make it Increase costs (e.g. use of MRP software to calculate requirements) Create the need for constant "firefighting" Reward people who are good at responding to problems (i.e. firefighting)
Long lead-time is necessary and can't be reduced		Don't question cause of long lead-time Ignore improvement opportunities Ignore queues		Maintain the status quo Unresponsive to changing customer needs Manage work-in-process and finished goods inventories
Large amounts of work-in-process are needed to meet customer requirements Inventories are an asset		Don't question the process Ignore improvement opportunities		Overproduction Manage work-in-process and finished goods inventories Increase costs (space and equipment needed to manage inventories)
Stamping machine change-over time can not be reduced Unit cost reduced by increasing volume		Accept large batch production method Ignore improvement opportunities Reduce number of set-ups		Maintain the status quo Overproduction Increase costs Slow response to changes in customer demand (volume and mix)
Raw material unit cost reduced by increasing purchase volume Can't change steel coil supplier's delivery terms		Don't question the process Ignore improvement opportunities Maintain five-day supply of steel coil		Increase costs (raw material and overhead) Manage raw material inventories

(*continued*)

Table I.
Current-state leadership beliefs, behaviors, and competencies

Belief: something accepted as true	→	Behavior: conduct based upon beliefs	→	Competency: an established skill or capability
Processes do not need to be connected to each other; each produces at own pace		No effort made to connect individual processes		Manage raw material, work-in-process, and finished goods inventories Slow response to changes in customer demand
I don't have to worry about what's going on in the factory; other people will take care of that		Stay in office Spend the day in meetings Blame people when things go wrong		No understanding of value-added and waste Poor observation skills Focus on the people, not the process

Table I.

2003). This, coupled with complex and confusing business metrics, results in a distorted view of reality, organizational politics, and blaming people when errors occur (Emiliani *et al.*, 2003; Emiliani, 2003) – none of which benefit customers.

The future-state value-stream maps shown in Figures 3 and 4 depict a situation in which leaders believe that certain aspects of business can be changed and is not difficult to do so. People are now learning how to respond and improve outside of the context and constraints of the current state. The underlying leadership beliefs have changed, which helps drive people to change how they go about doing their day-to-day activities (Argyris, 2002).

Tables III and IV show the beliefs that are immediately apparent from looking at the future-state value-stream maps shown in Figures 3 and 4, respectively, as well as related behaviors and competencies. Again, these are not intended to be a comprehensive account of all operative beliefs, behaviors, and competencies among leaders responsible for the current state. Rather, they simply illustrate some of the obvious beliefs that are now in play, which in turn lead to behaviors and competencies that form the basis of important management decisions such as stabilizing employment, keeping offices open, improving supplier relationships through collaborative problem solving, or insourcing work (Womack and Jones, 1996; Emiliani *et al.*, 2003).

The beliefs shown in Tables III and IV are remarkably different than those shown in Tables I and II. They result in four consistent leadership behaviors:

(1) question the process;

(2) support improvement opportunities;

(3) encourage system improvement; and

(4) identifying and eliminating waste.

If the leader questions the process and supports improvement opportunities, then followers are likely to do so as well. People will accept risk and enjoy work more because they are able to use their brains in the workplace. Competencies such as "challenge the status quo" and "cost reduction" improve competitiveness over time, and cause leaders to seek imaginative multi-lateral solutions to further improve competitiveness (Womack *et al.*, 1990; Nishiguchi, 1994; Fujimoto, 1999; Emiliani, 2000, 2003; Toyota, 2001; Sonoda, 2002; Emiliani *et al.*, 2003; Swank, 2003).

Belief: something accepted as true	→	Behavior: conduct based upon beliefs	→	Competency: an established skill or capability
Many processing steps are needed Add additional steps if needed		Don't question the process Ignore improvement opportunities		Maintain the status quo Increase costs (current labor, material, space, and equipment expenses and future liabilities, e.g. pensions and healthcare) Increase lead-times
59 workers are needed Add more workers if needed		Don't question the process Ignore improvement opportunities		Maintain the status quo Employ more people than are actually needed (i.e. over-hire) Increase costs (current labor, space, and equipment expenses and future liabilities, e.g. pensions and healthcare)
Existing individual process quality levels are good enough – especially if IGO is > 90 percent		Don't seek to improve overall system Set individual process performance measures Ignore improvement opportunities		Maintain the status quo Encourage and reward local optimization
Underwriting department dictates schedule and priority to each individual process		Don't question the process Communicate requirements to people at every operation		Cause confusion over what do make, how much to make, when to make it Create the need for constant expediting Reward people who are good at responding to problems (i.e. firefighting)
Long lead-time is necessary and can't be reduced No value lost in waiting		Don't question cause of long lead-time Ignore improvement opportunities Ignore queues		Maintain the status quo Unresponsive to changing customer needs
Automation is more efficient		Spend capital without questioning process Add complexity to process		Overproduction Increase costs & complexity
Producing in batches is more efficient – achieve economies of scale		Focus on local efficiency of associate rather than on product flow Ignore queues as source of cost System designed for batches		Overproduction Increase costs (raw material and overhead) Buy and produce in large quantities
Product "push" generates more throughput		Release more units into system Ignore downstream process status		Overproduction Increase costs (raw material and overhead)

(*continued*)

Table II.
Current-state leadership beliefs, behaviors, and competencies

Belief: something accepted as true	→	Behavior: conduct based upon beliefs	→	Competency: an established skill or capability
Sum of individual process efficiencies yield overall system efficiency		Set dysfunctional individual process or department performance measures		Reward dysfunctional behavior Encourage local optimization
Processes do not need to be connected to each other; each produces at own pace		Set disconnected production rates Ignore actual customer demand rates		Overproduction Increase costs and complexity
Inspect quality into the product		Add inspection or quality control operations into the process Ignore root cause analysis		Increase costs and complexity Reward people who are good at responding to recurring problems
Single-skilled workers are more efficient		Group similar functions together Ignore cross-training		Local optimization Reward specialists

Table II.

The competencies that result from these beliefs and behaviors are aligned with the desired competencies that sound business judgment would support (Basu, 1999; Emiliani, 2003). Further, the beliefs enable communication and development of intra- and inter-organizational learning routines that help improve competitiveness. Importantly, the beliefs exhibited result in value-added leadership behaviors (Emiliani, 1998) and competencies that permit the flow of information between people (Emiliani, 2003). This, coupled with simpler business metrics, result in a more accurate view of reality, less organizational politics, and a focus on the process instead of blaming people when errors occur (Emiliani, 2003; Emiliani *et al.*, 2003) – all of which benefit end-use customers.

Improving leadership effectiveness

Current-state value-stream maps vividly illustrate serious shortcomings in conventional management thinking and practice. The efficacy of the business system, and its implications for current and future competitiveness are enormous, as the current state maximizes the consumption of resources and is not responsive to changes in customer demand. In contrast, the future state consumes much less resources and is more responsive to changes in customer demand.

However, while senior managers may recognize the opportunity and approve implementation of future states, their basic beliefs about business may remain unchanged. In other words, showing senior managers current- and future-state value-stream maps will not by its self change their beliefs and lead to improved leadership effectiveness. So the question is, how do you change leaders' fundamental business beliefs? First, let's examine how most senior managers respond to improvement opportunities.

In most cases, the CEO or president delegates the improvements specified by the future-state value-stream maps to one or more vice presidents, who in-turn delegate

Belief: something accepted as true	→	Behavior: conduct based upon beliefs	→	Competency: an established skill or capability
Can make brackets with fewer processing steps		Question the process Support improvement opportunities Identify value added work, non-value added but necessary work, and waste		Challenge the status quo Cost reduction (current labor, material, space, and equipment expenses and future liabilities, e.g. pensions and healthcare) Reduce lead-times
Welding and assembly operations can be combined		Question the process Support improvement opportunities Separate work from waste		Challenge the status quo Employ no more people than actually needed Cost reduction (current labor, space, and equipment expenses and future liabilities, e.g. pensions and healthcare)
Need two shifts at the current time; maybe can get to one shift using new ideas		Question the process Support improvement opportunities		Challenge the status quo Carefully hire people/re-deploy people to other value-adding activities Cost reduction (current labor, space, and equipment expenses and future liabilities, e.g. pensions and healthcare)
Customer determines what to make, how much to make, when to make it – and transmit the information using simple *kanban* cards		Question the process Listen to customers Communicate requirements to people at last operation		Clarify what do make, how much to make, when to make it Reduce costs (e.g. eliminate MRP software for daily execution) Reduce or eliminate expediting Reward people who are good at improving processes
Lead-time can be reduced Waste exists in every process		Question cause of long lead-time Support improvement opportunities Identify value added work, non-value added but necessary work, and waste		Challenge the status quo Responsive to changing customer needs Waste identification and elimination Time-based competitiveness
Don't need large amounts of work-in-process to meet customer requirements Inventories are waste		Question the process Support improvement opportunities		Cost reduction (less inventory; less space and equipment needed to manage inventories) Understands customer needs
Stamping machine change-over time can be reduced Short change-over times reduce unit cost		Accept small batch production method Support improvement opportunities Increase number of quick set-ups		Challenge the status quo Produce to customer demand Reduce costs Fast response to changes in customer demand (volume and mix)

(*continued*)

Table III.
Future-state leadership beliefs, behaviors, and competencies

Belief: something accepted as true	→	Behavior: conduct based upon beliefs	→	Competency: an established skill or capability
Steel coil supplier is a valuable resource that can better serve our needs		Question the process Support improvement opportunities		Cost reduction (raw material and overhead) Develop supplier relationships
Buy only what is needed when needed				
Processes need to be connected to each other; produce what is requested by downstream process		Support efforts to connect individual processes		Synchronize material and information flows Fast response to changes in customer demand
I have to understand what's going on in the factory to help ensure customer satisfaction		Visit the shop floor frequently Work with people to improve processes Blame the process when things go wrong		Understands value-added and waste Strong observation skills Focus on the process, not the people

Table III.

implementation to lower-level managers and associates. Doing this indicates that senior managers view themselves as having different roles to play. They may view "leadership" as different from "improvement," or feel that their role in improvement, as they understand it, is better achieved by other means (Emiliani, 2000). This will create conflicts between people at different levels of the organization due to the simultaneous deployment of competing approaches to "improvement."

For example, if the president approves implementation of the future state, yet eliminates excess workers as a result of process improvements, then he or she views both actions as favorable improvements. Outcomes that are good for the company matter most, while those that are bad for affected workers matter much less. Most presidents would view the layoffs as an appropriate action, but perhaps unfortunate. This negative, mixed-signal outcome is a common occurrence. While the president will take credit for creating value from a short-term financial perspective, these actions actually destroy both financial value and value as perceived by end-use customers over the long run because the people that helped create the future state are gone. The affected workers were using their brains at work, but now senior management has cast aside some of the people that helped create the improvement. Not only are those people unavailable for future improvements, this action undercuts the desire of the remaining people to participate in future improvement activities. As a result, the value stream will soon revert to the current state. Favorable results cannot be sustained because the president's beliefs did not change – in particular, his or her beliefs about people and the purpose of business (Basu, 1999; Mintzberg *et al.*, 2002; Handy, 2002).

Senior managers that practice lean correctly know that eliminating excess workers as a result of process improvements is inconsistent with lean principles and practices. As might be expected, a key lean principle is continuous improvement. But there is a second key principle: respect for people. "People" includes not just associates, but also customers, suppliers, investors, and the community (Toyota, 2001). Improvements

Belief: something accepted as true	→	Behavior: conduct based upon beliefs	→	Competency: an established skill or capability
Can produce policies with fewer processing steps and/or processes can be combined		Question the process Support improvement opportunities Identify value added work, non-value added but necessary work, and waste		Challenge the status quo Cost reduction (current labor, material, space, and equipment expenses and future liabilities, e.g. pensions and healthcare) Reduce lead-times
Work content dictates staffing requirements		Separate work from waste Question the process Support improvement opportunities		Challenge the status quo Employ no more people than actually needed Cost reduction (current labor, space, and equipment expenses and future liabilities, e.g. pensions and healthcare)
Multi-skilled workers are an asset Maximize worker utilization		Promote cross-training of workers Maximize worker utilization		Challenge the status quo Carefully hire people/re-deploy people to other value-adding activities Cost reduction (current labor, space, and equipment expenses and future liabilities, e.g. pensions and healthcare)
Customer determines production rate Process scheduled in FIFO sequence at one point		Listen to customers Schedule single point in system		Clarify what do make, how much to make, when to make it Reduce costs (e.g. eliminate multiple scheduling points and expediting) Reward people who are good at improving processes
Lead-time can be reduced Waste exists in every process		Question cause of long lead-time Support improvement opportunities Identify value added work, non-value added but necessary work, and waste		Challenge the status quo Responsive to changing customer needs Time-based competitiveness Waste identification and elimination
Continuous flow production is efficient Ideal lot size = 1		Accept small batch production method Support improvement opportunities Identify and eliminate sources of queueing		Challenge the status quo Produce and respond to customer demand (volume and mix) Develop eyes for flow
Quality is the priority Build quality into processes		Identify and reduce sources of variability Improve system first pass yield Mistake proof processes		Root cause analysis Reduce costs (e.g. variability reduction) Mistake-proofing

(*continued*)

Table IV.
Future-state leadership beliefs, behaviors, and competencies

Belief: something accepted as true	→	Behavior: conduct based upon beliefs	→	Competency: an established skill or capability
Simplicity is the key to low cost		Identify and remove waste Question the process Simplify material and information flow paths		Challenge the status quo Cost reduction (current labor, material, space, and equipment expenses) Reduce overhead
Sum of local optima does not equal system optimum		Align and set system-wide performance measures Connect and align processes		Organizational alignment System thinking
Controlled inventory yields stable lead-times		Cap work-in-process inventory (i.e. pull/FIFO)		Cost reduction (inventory and materials management) Lead-time reduction and stabilization
Processes need to be connected; produce only when requested by downstream process		Support efforts to connect processes Establish unambiguous connections		Synchronize material and information flows Clear (i.e. low distortion) information flow

Table IV.

must benefit each of these key stakeholders, which helps gain their involvement and thus improves long-term competitiveness. Senior managers view associates as valuable resources with vast amounts of creative potential, and not as disposable assets.

In addition, lean managers understand that a key component of corporate purpose must be to balance both social (i.e. human) and economic objectives (Basu, 1999; Toyota, 2001). Not achieving balance increases costs and creates unwanted conflicts. Paradoxically, balancing social and economic results in better outcomes for investors if it is done correctly (Emiliani *et al.*, 2003), compared to the common financial-results-at-all-costs approach to management (Kelly, 2001; Mitchell, 2001; Handy, 2002; Mintzberg *et al.*, 2002) – which typically leads to poor long-term financial results. This is not surprising given that most conventionally managed businesses are run in the absence of well-defined principles and balanced corporate purpose.

So how do senior managers gain the beliefs shown in Tables III and IV? They do it simply through direct participation in, and later leading, improvement activities (Toyota, 2001; Emiliani *et al.*, 2003). They understand that improvement is part of leadership – not separate from it, and that that improvement activities cannot be completely delegated to others. It is these first-hand experiences that teach senior managers to see waste and understand value as perceived by end-use customers. On-the-job training – action learning – quickly helps them understand the two key principles, continuous improvement and respect for people, and how these interact with each other, and demonstrates the sensibility of balancing social and economic objectives. Facilitated correctly, continuous improvement activities are fun and memorable life-altering experiences that quickly change people's beliefs about business, people, and processes. From this springs new behaviors and competencies that lead to better outcomes.

The lean management system has clear advantages over conventional management practice with regards to financial and non-financial performance, resource allocation and utilization, human resource development, competitiveness, and customer satisfaction (Emiliani *et al.*, 2003). Decision making in conventional management practice is typically ad-hoc, and thus improvements are difficult to implement and sustain. The reason is because important features are missing from conventional business practice, e.g. the concept of value-added work, non-value added but necessary work, waste, and end-use customers; two key principles, continuous improvement and respect for people; and corporate purpose that balances social and economic objectives. Lean managers use these as guides for decision-making, and doing so requires them to think[2].

Improving leadership effectiveness starts with the creation of new beliefs. In conventional management practice, no mechanism is available to do this consistently across an organization. While leadership training programs based on organizational behavior theories or competency models may be helpful to some (Argyris, 1990; Goleman, 1998; Lucia and Lepsinger, 1999; Cooper, 2000; Boyatzis *et al.*, 2002), they do not address the fundamental beliefs that senior managers possess about business, people, and processes (Emiliani, 2003). Lean practitioners know the only way to do that is through direct participation in fast-cycle continuous improvement activities. In other words, seeing is believing.

Summary

This paper described the use of value-stream maps for determining the beliefs, behaviors, and competencies possessed by business leaders. Examples of current- and future-state value-stream maps were provided for both manufacturing and service business processes. The current-state value-stream maps depict customer fulfillment processes that consume large amounts of resources, while the future-state value-stream maps depict customer fulfillment processes that consume much less resources. The difference between current and future states highlights the ineffectiveness of most senior managers as well as traditional leadership development programs.

Value-stream maps reveal the fundamental beliefs possessed by senior managers, which in turn lead to behaviors and competencies that directly impact financial and non-financial performance, resource allocation and utilization, human resource development, competitiveness, and customer satisfaction. They can be used as diagnostic tools to identify leadership problems and pathways for improving leadership effectiveness. Current- and future-state value-stream maps are simple, high-impact, one-page illustrations whose significance relative to business performance can be easily grasped by senior managers. This stands in contrast to abstract leadership development models and training programs based upon organizational behavior theories or competency models that do not directly relate to actual business processes.

However, the maps alone are not usually sufficient to get senior managers to change their fundamental beliefs about business, people, and processes. Too often, the missing ingredients are senior management participation in the improvements specified by the value-stream maps and the absence of guiding business concepts, principles, and corporate purpose rooted in balancing social and economic objectives. Further, it is not customary for senior managers skilled in conventional management practice to

directly participate in continuous improvement activities. As a result, they do not obtain the first-hand experiences that are needed to form new beliefs and thus improve leadership effectiveness. Conversely, the lean management system, practiced correctly, requires periodic direct participation by senior managers. This results in the formation of new beliefs, which drive the development of new behaviors and competencies over time that are much better aligned with desired business outcomes, both stated and inferred.

Notes

1. The correct practice of lean requires senior management to re-deploy the people made available through process improvement to other parts of the business. It is a gross violation of lean principles to lay people off as a result of improvement activities. True lean managers recognize that employees should not suffer due to management's prior inability to see waste. To better understand human resource policy and practice in a lean business, see Emiliani *et al.* (2003).
2. A better name for the "lean management system" would be the "thinking management system," because it more accurately describes the basic requirement for all leaders, managers, and associates. But even that name does not capture the full scope of what people actually do, which can be expressed as the cycle: think-do-evaluate-improve.

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