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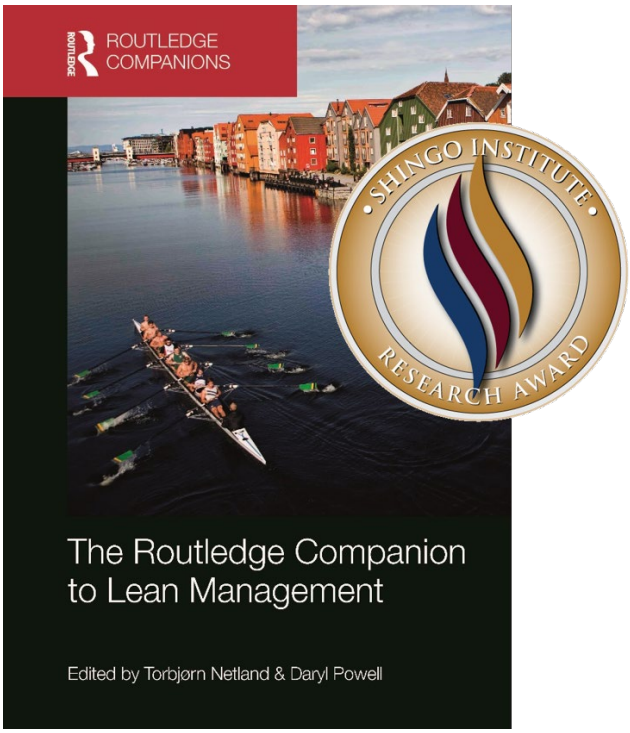

Chapter 40 A Lean World

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Chapter 40
A Lean World

Torbjørn H. Netland and Daryl J. Powell

Introduction

This companion provides a deep investigation into one of the most celebrated, used, and criticized business concepts of our time, namely lean management. Today, lean seems to be on everyone's lips—not only across all functional areas of the traditional manufacturing enterprise (Part I of this book) but also in many different industries (Part II). Whereas other business concepts have proven to be short-lived and faddish, lean has maintained a strong position for almost three decades; what is more, it is gaining momentum. Lean is spreading far beyond its original environment on the shop floors of Toyota Motor Manufacturing. As Figure 1 illustrates, the spread of lean thinking across the enterprise and into new industries is continuing at a rapid pace. This chapter, which constitutes Part III of the companion, discusses what the emergence of "a lean world" means for our understanding of lean in the broader sense.

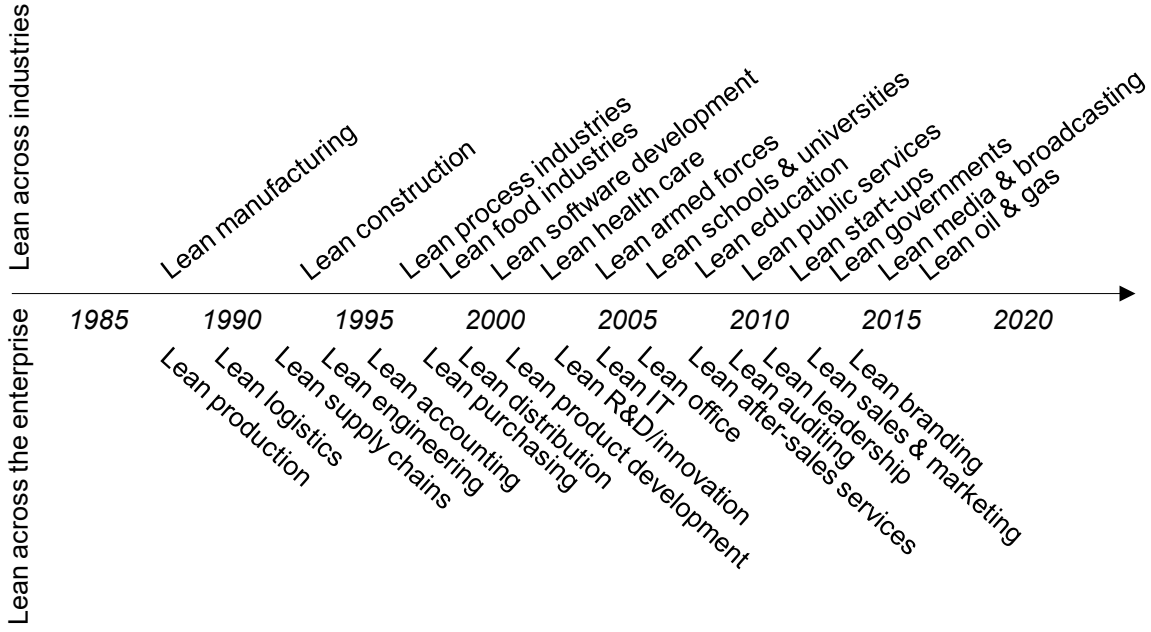

Figure 1. The spread of lean thinking across the enterprise and select industries.

In the spirit of learning, before you read the rest of this chapter, ask yourself the following: Can an organization do lean without knowing its customers? Without aiming to reduce variation? Without paying attention to just-in-time (JIT)? Without pulling production to the demand of customers? Without paying attention to standards? If your answer was "no" to one or more of these questions, you are likely to learn something new in this chapter, just as we did in working with the 71 contributing authors in this companion on lean management.

The various chapters describe and discuss what "lean" looks like in different settings. To our surprise, it is clear that what is lean in one setting may be completely anti-lean in another. Take "reduction of variation" as an example: Many authors claim that variation is the number one enemy of lean (e.g., Modig and Ahlström, 2012; Bicheno, 2004), but as Schuh et al. (chapter 5), Rossi et al. (chapter 6), and Poppendieck (chapter 34) explain, creating *more* variation is a goal in successful *lean innovation*, *lean product development*, and *lean software development*. Another example is Toyota's archetypical JIT principle. There is no doubt that this principle is appropriate for application to assemble-to-order manufacturing companies, but its legitimacy is less clear in *lean remanufacturing* (chapter 16), *lean engineer-to-order industries* (chapter 25), *lean armed forces* (chapter 29), *lean policing* (chapter 30), or *lean education* (chapter 37), to mention a few. There are several inconsistencies like these in the common understanding of lean, and these have the potential to disrupt and ruin any lean transformation. It is therefore important to clarify what the essence of lean is as it applies in different settings; this is our goal in the present chapter.

Back to the roots of lean production

As a concept, lean has evolved since it was introduced by Krafcik (1988) and made popular through the publication of *The machine that changed the world* by Womack et al. (1990). The MIT International Motor Vehicle Program showed that Toyota in the late 80s used less of everything compared with its mass-production competitors but still produced more products with a higher variety, higher quality, and lower cost. Toyota's production system represented nothing less than a paradigm shift in manufacturing (Holweg, 2007). (For detailed discussions of the history and evolution of lean, see Jones and Womack, chapter 1, Liker, chapter 2, and Found and Bicheno, chapter 3). Considering Toyota's staggering performance, it came as no surprise that companies all over the world tried to replicate the Toyota Production System under the label "lean production."

The first descriptions of Toyota's production system focused on logistical and technical aspects (e.g., Ohno, 1988; Sugimori et al., 1977; Shingo, 1986). Total quality management (TQM), total productivity maintenance (TPM), and JIT logistics were essential to Toyota's performance and became an integral part of our descriptions of lean production (Cua et al., 2001). In addition, Toyota valued the principle of "respect for people," using human resource management (HRM) practices, such as teamwork, cross-training, and a coaching leadership style (Spear and Bowen, 1999; Liker and Hoseus, 2008). Based on an empirical study by Shah and Ward (2003), these four "interrelated bundles of practices"—TQM, TOM, JIT, and HRM—have come to represent one of the most used academic conceptualizations of lean production.

Developing and implementing TQM, TPM, JIT, and lean HRM practices is one way to build the foundation of lean capability in a production company. Because these four bundles of practices are complementary, they should be developed in parallel, not in sequence or isolation (Furlan et al., 2011; Shah and Ward, 2003). However, to become a lean manufacturer, it is not enough to introduce new lean practices in the workplace. Rather, the foremost characteristic of a lean production company is that it continuously challenges and improves on these practices. That requires the meta-capability of *continuous improvement* (CI; "kaizen" in Toyota lingo). In our understanding, adding CI to TQM, TPM, JIT, and lean HRM practices provides a reasonable and useful conceptualization of lean production (illustrated in Figure 2).

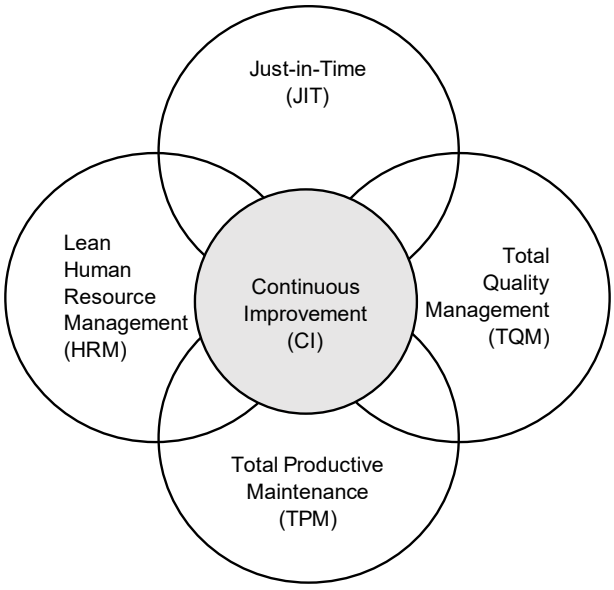

Figure 2. The five elements of lean production.

Figure 2 is consistent with a large body of research on lean production, and the elements are similar to those of many corporate lean programs of large manufacturing companies (see Netland, chapter 22). However, the question is whether the five elements in Figure 2 also provides a reasonable understanding of lean thinking when it disseminates beyond the production floor—to administration, sales and marketing, the production development department, and so on—and beyond the bounds of the manufacturing enterprise to the healthcare sector, public services, the education system, and so on. An analysis of the chapters in this book only finds CI to be considered and applied in all settings. The four other elements of lean production are more or less relevant depending on the specific situation and environment. Good examples are the biases toward JIT in *lean distribution* (see Reichart and Holweg, chapter 20) and toward TPM in *lean public water supply* (see Scholten et al., chapter 32). Both of these examples make intuitive sense. Therefore, whereas the model in Figure 2 provides a useful conceptualization of "original" lean in production and manufacturing environments, new models are needed to understand lean in the modern extended enterprise and new industries.

Revisiting the five lean principles

The five lean principles developed by Womack and Jones (1996) are perhaps the most referenced "explanation" of lean thinking and promise to be generic principles. Several of the chapters in this book (and many other articles) use the five lean principles to structure the discussion on what lean could be in a specific application area. Womack and Jones (1996) presented the five lean principles as a distillation of lean thinking. Although often used as "the definition of lean," a reassessment of the five lean principles shows that it is difficult to apply them directly in many settings and application areas. Below, we take a deeper look at each of the five principles in turn, which are as follows:

1. Define value for the customer;
2. Identify the value stream;
3. Create flow by eliminating waste;
4. Establish pull; and
5. Seek perfection.

Principle 1: Define value for the customer

The first lean principle is as follows: "Specify value from the standpoint of the end customer" (Womack and Jones, 1996; Marchwinski and Shook, 2006). This has worked seamlessly in a wide selection of industries and helped many businesses change their mindset from an inward-looking resource efficiency perspective to a customer-driven flow efficiency perspective. Applying this principle first requires identifying the customers and then specifying what they value. A typical definition of a "customer" is "someone who buys a good or service from a business," for example, a consumer who buys commodities in a store, a car at a dealership, a meal in a restaurant, or a haircut at a hairdresser. Business-to-business examples include an aircraft manufacturer that purchases jet engine parts from a supplier or a governmental institution that buys accounting services from a consultancy house. In all of these examples, it is not hard to identify the customer or specify what the customer values.

While this fits easily into some contexts, the first lean principle is more difficult to apply in other settings. In health care, for example, it is easy to look at the patient as the customer (this is even helpful and may radically improve the quality of a particular healthcare service), but the picture is not as clear-cut as in the examples above (see Jones, chapter 23). Often, the patient is not paying for all of the healthcare services she receives. Rather, the society may be the "paying customer" through governmental tax systems. Patients' next of kin are also "customers" in a sense. Furthermore, one of the biggest challenges for lean health care is that patients are unique individuals with partly overlapping, partly competing needs—all requesting services from the same, limited resources.

The identification of value for customers is even more difficult in the primary and higher education systems (see Wiegel and Brouwer-Hadzialic, chapter 37; Riezebos, chapter 38; and Yorkstone, chapter 39). Let us take the example of a primary school. Who are the "customers" of a school? Are they the learners, the parents, the government, the taxpayers, or other groups? Some would quickly point to the schoolchildren as the customers in this setting. However, "learning" is not a commodity that can be transferred from a supplier to a customer. Rather, it is co-created in the learning process between the learner and the teacher. Hence, using business lingo, the learner is both a supplier and a customer (the same is true for many other transformational and experience-based services). In lean education, it is therefore practically impossible to deliver the highest value for each of the "customers." As Wiegel and Brouwer-Hadzialic (chapter 37) explain, "Different

types of students will need different forms of support and different types of pedagogy will have different needs in terms of group size, IT facilities, and classroom organization." For these reasons, the discussion on "value for the customer" is often a barrier for lean in the education sector.

The concept of customers and value is also difficult in many other lean application areas. Who can be identified as the customers of public services (Radnor, chapter 28), the military (Bateman and Hines, chapter 29), law enforcement (Barton et al., chapter 30), or the justice system (Martins et al., chapter 31)? What about art, drug rehabilitation, undertaker, or prison services? In her case study on Royal Tax, Radnor (chapter 28) ironically asks, "Who's the customer of Royal Tax?" The answer is "everyone" (in the United Kingdom). Although it is difficult to think in terms of customers in all settings, the chapters in this book show that lean still has a lot to offer in multiple application areas.

Principle 2: Identify the value stream

The second lean principles is to "Identify all the steps in the value stream for each product family" (Womack and Jones, 1996; Marchwinski and Shook, 2006). The limitation of this principle is noticeable in industries that make and deliver one-off, custom-made products and services (see, e.g., *lean engineer-to-order (ETO)* as discussed by Powell and van der Stoel, chapter 25, and occasionally *lean construction*, as considered by Ballard, chapter 24). In dynamic environments, value streams do not remain as stable as they would in a high-volume, low-variety production environment. This is particularly true of project-oriented situations, wherein project value streams are characterized as a temporary endeavor. Certainly, some projects have a repetitive nature and can easily benefit from a detailed mapping and understanding of the value stream. However, if each project has a unique value stream, a simple high-level process map may be the best thing available.

The idea of detailed process mapping, such as in "value stream mapping" (Rother and Shook, 2009), is also challenging in the education sector. Value streams are easier to identify in back-office operations, such as student admission, semester payments, and examination procedures, than in the front-office learning processes of the classroom. Perhaps this explains why lean has mostly been applied to back-office operations in this sector (Wiegel and Brouwer-Hadzialic, chapter 37; Riezebos, chapter 38; and Yorkstone, chapter 39). Moreover, in other sectors with extreme

variation (often human-centered sectors), such as sales, emergency departments, police work, armed forces, and sports, value stream mapping is often most useful in the back-office support processes rather than the core value-creating processes.

Principle 3: Create flow by eliminating waste

The third lean principle is as follows: "Make the value-creating steps occur in tight sequence so the product will flow smoothly toward the customer" (Womack and Jones, 1996; Marchwinski and Shook, 2006). From a productivity perspective, flow is always smart (Schmenner, 2001)—and it is an integral part of both mass production and lean production. Creating flow is easier in automotive assembly operations (Found and Bicheno, chapter 3), *lean mining* (Ghodrati et al., chapter 26), and *lean public water supply* (Scholten et al., chapter 32) than in *lean branding* (Busche, chapter 13), *lean remanufacturing* (Pawlik et al., chapter 16), and *lean dealership* (Brunt, chapter 33), to give some examples. The flow principle is also extremely difficult to achieve in knowledge-based work, such as product and software development (Rossi et al., chapter 6; Poppendieck, chapter 34).

In Toyota lingo, the third lean principle is about "muri," "mura," and "muda." Toyota regards the reduction of waste ("muda"; that is, everything that does not add value to the customer) as important but asserts that an organization can only reap the real benefits of waste reduction *after* resources are shielded from overburden ("muri") and unevenness ("mura"). Unfortunately, this wisdom has not reached all organizations that seek to implement lean; although the objective of the third principle is to create flow, it is often interpreted simply as "reduction of waste" due to an overemphasis on muda at the expense of muri and mura. Waste reduction seems to have immediate appeal in all settings that are new to lean because we can all see "wastes" or inefficiencies in our workplace. Even if the customer is hard to identify, there is always waste that can be pointed out. Therefore, one of the first things that usually happens when lean is introduced into a new area is that authors and consultants propose new classification of wastes for the specific area. This is usually based on Taiichi Ohno's categorization of seven sources of waste, namely transportation, inventory, motion, waiting, overproduction, over-processing, and defects. Examples are included in this book in the chapters "Lean innovation," "Lean sales and marketing," "Lean after-sales services," "Lean retail," "Lean justice," and "Lean universities." Perhaps this signifies the infancy of lean in these application areas.

Principle 4: Establish pull

The fourth lean principle of Womack and Jones (1996) is as follows: "As flow is introduced, let customers pull value from the next upstream activity" (Marchwinski and Shook, 2006). However, as we shift our focus from the factory floor at Toyota to other settings, the way in which this principle is operationalized requires a reconsideration of pull as a concept. A traditional pull system, such as the Kanban system, authorizes value-adding activities to take place based on the consumption of *materials*. However, some settings are better off if free *capacity* in the production system is what pulls in a new order. This can be demonstrated through applying the drum-buffer-rope principle of bottleneck control theory, as in the theory of constraints (Goldratt and Cox, 1984). A good example of this can be found in the chapter on *lean maintenance, repair, and overhaul* (Srinivasan, chapter 27), which integrates the theory of constraints with lean.

In chapter 29, Bateman and Hines suggest the term "demand readiness" instead of pull in the context of public services, for example, when a patient "pulls" services from a healthcare provider. Again, this definition of pull considers the state of the process, while the capacity of the process is not consumed without a clear signal or requirement from a customer. The process is itself "demand-ready," and no work is carried out unless there is a clear customer signal (avoiding overproduction). Thus, we can conclude that it is a combination of the state of the system and the flow-controlling mechanism (authorizing consumption of capacity) that creates the distinction between push and pull in the wider context.

Principle 5: Seek perfection

Finally, the fifth lean principle is as follows: "Continuously improve the processes" (Womack and Jones, 1996; Marchwinski and Shook, 2006). Our analysis of the chapters in this companion shows that this principle is the most versatile of the five lean principles. Creating a culture of continuous improvement is essential for the success of a lean transformation in any industry. According to Jones (chapter 23), "What distinguishes lean from other process improvement methodologies is its focus on developing the capabilities of the front-line teams to manage and continuously improve their work." The ability of all employees to reflect on current ways of working and to improve these continuously is the only means by which the significant results one would expect from a successful lean implementation can be achieved. The next question is how to make employees able

to engage in continuous improvement. The authors of the chapters in this companion agree that this requires a culture of *learning*. We dedicate the next section—"the essence of lean"—to learning and how to achieve it.

The essence of lean

We suggest that the essence of lean—as it applies to all functional areas of the enterprise and different industries and sectors—is continuous improvement, with learning at its core. Hence, present-day lean thinking is ultimately about creating the learning organization (e.g., Senge, 1990; Garvin, 1993). A precondition for this is developing a long-term perspective. In addition, fostering organization-wide learning requires a special form of leadership. We call these the three essential Ls of lean—learning, a long-term perspective, and leadership.

Learning

Just as rapid learning cycles is the essence of lean innovation (Schuh et al., chapter 5), lean software development (Poppendieck, chapter 34), and lean startup (Ries, 2011), the success of the Toyota Production System (TPS) was very much built on a scientific method of learning (Liker, chapter 2). It is not without reason that the TPS has been called "the thinking production system." Through many small scientific experiments, Toyota updates its standard operating procedures to represent the state of the art and quickly trains all employees in the new and better standards. To accomplish this, Toyota uses Deming's plan–do–study–act (PDSA) cycle, as this approach encourages continuous reflection and improvement among all employees. The trick is to go beyond "know-how" to create a deep understanding of "know-why." Furthermore, because learning occurs when the outcome of an experiment is the predicted result, successful lean organizations exhibit a no-blame culture, as "failure" and problems are a necessary and valuable part of any learning process. Improvement without a focus on learning is *not* lean thinking.

Long-term perspective

A successful lean transformation requires a long-term perspective. Unfortunately, creating lasting improvement is often *not* the starting point of many lean initiatives. Rather, cost cutting is considered as the main driving force for the implementation of lean in most industries that are new to the concept. A few examples are health care (Jones, chapter 23), the mining industry (Ghodrati et al., chapter 26), public services (Radnor, chapter 28), the armed forces (Bateman and Hines,

chapter 29), police departments (Barton et al., chapter 30), and the printing industry (Macro, chapter 35). Budget cuts are also a driving force in many other sectors that have recently encountered lean, including airlines, banking, broadcasting, governments, insurance, law firms, oil and gas, telecom, and so on. The problem is not that practical "lean" tools and techniques do not deliver quick cost-cutting results. They can do that. Rather, the issue is that these results will not last. Although value stream mapping workshops and "waste walks" can cause rapid changes, the benefits soon wear off if continuous learning is not part of the transformation. Application of methods without a long-term perspective on learning is *not* lean thinking.

Leadership

Creating a learning organization is easier said than done. Thirty years of trial and error related to implementing lean in many sectors has taught us that it necessitates a special form of leadership, namely "lean leadership" (see Liker, chapter 2; Ballé, chapter 4; Brunt, chapter 33). Ballé argues that lean leadership is a set of *practices* and not a theory or principles; it cannot be done in an office, outsourced to consultants, or summarized in a boardroom presentation. Perhaps the three most essential lean leadership practices are as follows: (1) go observe directly at gemba, (2) always challenge the current state of affairs by asking questions, and (3) develop a coaching leadership style (Spear, 2004; Rother, 2010; Liker and Convis, 2011). Often, this requires a complete shift in how management is performed, which again explains many failed attempts at lean transformations. This is also the fundamental message behind the "lean transformation framework" (Shook, 2014), presented in detail in this book by Brunt (chapter 33). Regardless of where a lean transformation begins, the lean transformation framework promises to set a premise for *any* successful enterprise transformation.

Jones (chapter 23) points out that as soon as you tell someone what to do, you take away that person's responsibility to learn. Admittedly, developing lean leadership capabilities can be more difficult in some organizational cultures than in others. In this companion, we can read that the strong hierarchical cultures of the police force (Barton et al., chapter 30) and the military (Bateman and Hines, chapter 29) are hurdles for lean transformations in these sectors. The healthcare and education sectors have similar challenges due to their strong profession-centered cultures, where doctors, teachers, and professors would like to preserve power (Jones, chapter 23; Riezebos, chapter 38; Yorkstone, chapter 39). Technically, however, these characteristics should not stop

these industries from developing lean organizations. Discussing lean healthcare, Jones reminds us that "lean uses the same scientific method to diagnose and treat organizational problems as doctors use to diagnose and treat medical problems." Examples like the Consorci Sanitari Del Garraf in Spain (see the case study in chapter 23) and Baerland primary school in Norway (c.f., chapters 37 and 38) show that it is also possible to develop lean cultures outside the traditional manufacturing environment. A lean journey without dedicated and engaged leaders, however, is destined to fail.

Conclusions

We started this chapter by asking a few questions relating to the characteristics of a lean organization, as follows: Can an organization do lean without knowing its customers? Without reducing variation? Without paying attention to JIT? Without pulling production to the demand of customers? Without paying attention to standards? If you are thinking of *lean production* (i.e., the TPS), the correct answer to all of these questions should be "no." However, it should be clear by now that the answer to any of the above questions could be "yes" in a different sense. It is not easy to define "customers" in primary education, yet we have *lean schools*. Reduction in variation can hamper innovation, yet we have *lean innovation*. JIT and pull production are not easy to apply in law enforcement, yet we have *lean policing*. Different students' learning processes are non-linear and non-standard, yet we have *lean education*. Hence, what is lean in one setting may not be lean in another. It is clear that a one-size-fits-all approach to lean is a strategy for failure. Thus, managers must tailor lean to the characteristics of the specific industry and organization.

The common characteristic of lean that we found across all application areas in this book was continuous improvement. Lean—cut to the core—is about creating a culture for continuously improving the operations of a business or organization. Everybody in the organization should be engaged in improvement activities using problem-solving methods. We suggest that any lean transformation—regardless of the sector and application area—is dependent on the three essential Ls of lean: learning, a long-term perspective, and leadership.

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