

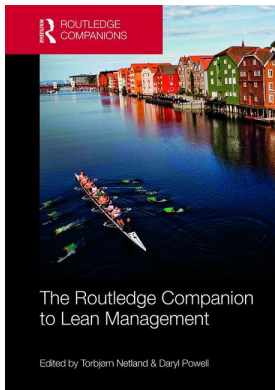
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## The Routledge Companion to Lean Management

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### Lean and Green

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## LEAN AND GREEN

*Keivan Zokaei, Ioannis Manikas, and Hunter Lovins*

**Introduction**

Lean often focuses on waste (non-value-adding processes) reduction from the system, which leads to cost minimization. It also strives for continuous process improvement to achieve level scheduling and economy of scale in the operation. This enables organizations to augment the quality of the product and improved services by transforming the traditional batch and queue production system (Larson and Greenwood, 2004). On the other hand, the green supply chain emphasizes sustaining the organization, people, and future generations. This is based on 3Ps—people, profit, and planet—and strives for reduction in the use of natural resources and CO<sub>2</sub> emissions and for recycling used products; it also applies the reduction of environmental risks and improving ecological efficiency (Carvalho and Cruz-Machado, 2009).

Lean refers to “nimble” or “with less fat” and is a Western interpretation of the Toyota Production System and the Toyota Way. The Toyota Production System is generally associated with the elimination of all types of waste from a process in order to increase the throughput of the whole system. Womack and Jones (1996) further elaborated the idea by discussing how lean thinking can be applied beyond the automotive sector.

The lean supply chain is about lean time reduction and value enhancement for customers; it follows the principles of just-in-time (JIT) and also strives for “zero inventory,” although, as Grunwald and Fortuin (1992) pointed out, it is unrealistic to have zero inventory as this simply means zero output. Some inventory would still remain at different stages of the supply chain such as the production and distribution systems. Supply chains should therefore push forward to set up *minimum reasonable inventory* (MRI). However, Simons and Taylor (2007) showed how the UK red meat industry failed to achieve leanness in the system due to the lack of deep supplier relationships (“*kiertsu*” in Japanese). They also brought forward the idea of extensive supplier relations to implement effective leanness in the supply chain.

The lean supply chain also promotes a pull system, for example by means of visual signaling systems such as *kanban*. In order to create a pull system, it is necessary to reach a smooth and predictable demand with low variety, and to strive for “continuous improvement” in the system (Naylor et al., 1999).

The concept of a sustainable supply chain is also known as the “triple bottom line” where three aspects are considered: people, profit, and planet. None of them is subject to compromise.

Therefore, supply chain strategies should reflect concerns with social issues like working conditions, human rights, and health conditions, and other environmental issues like usage of natural resources, energy, water, air, and the natural habitat and ecosystem, and most importantly maintain economic profitability and growth (Rao and Goldsby, 2009; Christopher and Holweg, 2011).

Integrating lean management with environmental sustainability practices is an idea that came to light recently, although both paradigms developed separately decades ago and have been in practice successfully in many organizations. Originally developed by the Toyota Motor Corporation, lean management strives to eliminate the waste (non-value-adding tasks, like overproduction and over processing, and waiting in terms of idle staff and machinery, etc.) from the system and is based upon the idea of JIT production. At the operational level it includes some mechanisms such as kanban (production starts with a “pull” signal), *takt* time (the rate of production matches the rate of sales in the market), 5S system (shop floor housekeeping), poke-yoke (error-free production), and SMED (“single-minute exchange of the dies” which is a changeover technique in the production system). All these mechanisms contribute to make the *lean supply chain* (Carvalho and Cruz-Machado, 2009; Stone, 2012). On the other hand, sustainability is based upon the 3Ps, people, profit, and planet, where reducing the environmental risk and improving ecological efficiency of organizations and other partners in the supply chain is the prime motive. Environmental sustainability involves reduction in CO<sub>2</sub> emissions at every stage of the supply chain and reduction in the consumption of natural resources such as water, land, or natural gas. Moreover, at the operational level it includes various concepts like sustainable design (product design), sustainable source (procurement from a sustainable source), sustainable production (fewer raw materials, by-product treatment etc.), sustainable delivery (local source, less carbon mileage), and sustainable return (end-of-product-life treatment, reverse logistics). It also incorporates practices like the 3Rs (reduce, reuse, and recycle), 5Rs (3Rs, redesign, and re imagine), and carbon and water footprint reduction from the upstream to the downstream components of the supply chain (Vermeulen and Seuring, 2009; Walker and Jones, 2012).

There could potentially be a clash between the two paradigms as lean is based upon the JIT system where small batch production and frequent delivery of raw materials are the norm, whereas the green supply chain emphasizes less transportation and fewer CO<sub>2</sub> emissions. Economic and environmental continuous improvements are usually located in separate organizational silos and sometimes are even in conflict with each other. Integrating them could be the biggest opportunity missed across most industries. There is a lot that the environmental movement can learn from the lean and quality community about people engagement, structures, and methods. Equally importantly, the lean community can find a new purpose and once again lead the continuous improvement of their organizations using environmental waste as a proxy for identifying key areas for economic progress. Hines (2010) argued that lean thinking must be green as it emphasizes waste reduction and reduces the amount of energy use and by-product waste. Therefore, it acts as a green chain. He also proposed a generic model to combine these two conflicting paradigms. Yet *greening* the supply chain does not necessarily involve only CO<sub>2</sub> reduction. However, some organizations try to “*green-wash*” it by only reducing the CO<sub>2</sub> emissions in the transportation stage, instead of investing in product innovation and green product design if the product (for example, an automobile) is going to produce high amounts of CO<sub>2</sub> emissions during its lifetime. The trade-offs and the boundaries of lean and green should therefore be analyzed and clearly marked (Dües et al., 2011).

### **Lean and Green Integration: A Governance Shift**

Jonathon Porritt, founder of the Forum for the Future, argues that a governance shift is occurring in the field of sustainability, where governments are stepping back and businesses stepping

forward to lead the change (Zokaei et al., 2013). Prior to the 2008 financial crisis, environmental policies of the US and the EU had an influence in the formulation of the strategic planning of several large companies, where, for example, political, economic, social, and technological (PEST) analysis was systematically used for business macro-environment analysis (OECD, 2011). In the post-crisis world fewer governments demonstrate real appetite for transformative economic policy of the sort necessary to reduce the risk of climate disruption. Nor do they demonstrate efforts to ensure that the billions of developing country residents get an equitable shot at sustainable prosperity, despite rhetorical concern for future generations, typically expressed by imposing austerity to reduce debt (Lovins and Cohen, 2012). For example, policy makers failed to make binding commitments at the Rio+20 Summit, resulting in the lowest common denominator consensus delivering few scalable benefits. In 2010, the UK Sustainable Development Commission (SDC) was axed as part of cutting down expenses. In the US, Republican energies to defund the entire Environmental Protection Agency risk even deeper structural shifts.

Simultaneously, private sector companies are cutting carbon emissions to enhance profitability, signing declarations to account for the value of nature, and safeguarding jobs by making their businesses more sustainable and more profitable. The proactive approach of leading-edge companies that put sustainability at the heart of what they do is inspiring. Greater sustainability has become a key economic driver for firms such as Toyota, Walmart, DuPont, Volvo, Sainsbury's, Tesco, Unilever, Marks & Spencer, General Electric (GE), Adnams, and Worldwide Fruit. All of these firms have invested heavily in greening their products and processes over the past few years.

On the other hand, small and medium enterprises (SMEs) are considered as central contributors to sustainable development. Sustainability strategies in SMEs have recently been investigated in the context of value creation and increase of innovation capacity (Moore and Manring, 2009; Klewitz et al., 2014). According to Lloyds corporate research (Lloyds, 2014), 25 percent of SMEs in the UK placed sustainability high on their list of priorities for 2014, and 30 percent of them expect to increase their investment in sustainable business practices over the next five years while still focusing on traditional green activities such as energy saving and recycling rather than broader areas such as supply chain management and purchasing. Consider the following examples:

- *DuPont*, one of the early leaders, committed itself to a 65 percent reduction in greenhouse gas emissions in the 10 years prior to 2010. By 2007, DuPont was saving \$2.2 billion a year through energy efficiency, almost equivalent to its total declared profits for the same year (Russel, 2011).
- One of today's leaders, *Unilever*, plans to double its revenue over the next 10 years while halving the environmental impact of its products.
- *GE* is on track to reduce the energy intensity of its operations by 50 percent by 2015. Its Eco-magination project, if a separate company, would be Fortune 130.
- *Tesco* has announced that it will reduce emissions from stores and distribution centers by half by 2020 and that it will become an altogether zero-carbon business by 2050.
- *Walmart*, aiming at *zero waste*, claims to have diverted more than 80 percent of trash generated in its US operations from landfill. In 2010, Walmart announced it would cut total carbon emissions by 20 million metric tons by 2015 (Walmart, 2013).
- In the UK, *Sainsbury's* announced the "20×20 Sustainability Plan" as a cornerstone of its business strategy. So far it is on track against the plan. In April 2013, for example, it had already beaten a self-imposed target to reduce water consumption by 50 percent (Osborn, 2013).

- *Toyota*, in its Fifth Environmental Action Plan, committed to improve average fuel efficiency of its vehicles by 25 percent in all regions by 2015 compared with 2005. In production, it had already cut emissions per vehicle by 37 percent between 2001 and 2012 (Daihatsu, 2013; Toyota Motor Corporation, 2013; Pagliarella, 2014).

Since none of these companies joined Greenpeace, one may question why they show such a level of commitment to sustainable development. Their secret is in a simple yet powerful realization that their environmental and economic footprints are aligned. When physical waste is prevented, energy efficiency is increased and resource productivity is improved; this is when money is saved, profitability is improved, and competitiveness is enhanced. They are correcting decades of neglect to capture huge “quick win” opportunities, discovering that environmental wastes are a proxy for economic savings.

### A Parallel Story from Quality Management

Lean thinkers discovered precisely this about the lean wastes of variation, overburden, overproduction, and inventory: that they are key substitutes for economic development. The “greening industry” movement now stands where the “quality movement” was 40 years ago. Since then, the industry realized that quality can be improved through cheaper means. The quality movement, variably referred to as total quality management, Six Sigma, lean sigma, or just lean, found that there is no intrinsic dilemma between quality and cost.

When quality gurus Deming and Juran went to Japan in late 1940s and 1950s to help rebuild the war-torn economy, they were being overlooked in the triumphant West. In a devastated economy they started an industrial regeneration that allowed companies such as Toyota to become a benchmark for lean management. By the 1970s, as the West faced rising oil prices, the work of the quality gurus started gaining interest, mainly due to the constant growth and prosperity that the Japanese companies continued to achieve in spite of the oil crisis. During this period, European and US companies, seeking a way to regain profitability, found that the somewhat hazy know-how of the East was best distilled in the work of Phil Crosby. He not only contributed greatly to the promotion of the total quality movement with his accessible style and plain speech, but in his 1979 bestseller *Quality is Free* famously claimed that “quality is not a gift, but it is free” (Crosby, 1979).

Crosby, and the other quality gurus, defied conventional wisdom of the time that it must cost exponentially more to get to the highest levels of quality because each increment of quality has its own price. They pointed out that poor quality creates hidden costs, including the need for inspection, rework, scrap, delivery delays to the customer, and potential costs during product use. These typically dwarf what it might cost to implement systems and training to prevent defects in the first place. Thus enhanced quality had to be achieved. The costs to do so saved so much money by implementing more cost-effective production systems that the resulting quality was effectively free.

Equally, “the environment is free.” Implementing more sustainable methods to make products and services reduces environmental impact as, counterintuitively, it brings lower costs. The reasons are the same ones that reinforced the “quality movement” of the 1960s to 1970s: low-quality products or services result in wasting time, energy, and resources. Making it right the first time is much more cost-effective and guarantees better customer satisfaction. In the same way, sustainable business means saving resources and energy, which in turn means better quality and much more cost-effective products. Waste generation and harmful emissions are eventually outcomes a company actually pays to incur, but from which, by all means, no benefit derives. These outputs should be better named as “unsalable production” (Lovins et al., 1999).

However, the environment is not a gift. As with the quality movement, prevailing paradigms that see environmental protection as a cost prevent executives from capturing better performance and lower costs. Just like the quality movement, the reasons behind leading-edge companies' attention to the environment is not the environment per se, but rather the business competitiveness that the new paradigm of sustainable business offers. The companies that move fastest to adopt "the environment is free" outlook will be the billionaires of tomorrow. *Greening your business is not just a "nice to have"—it is a "must have,"* just as lean and total quality have become a necessity for most businesses for decades.

More important, the benefits are additive. Businesses can implement more sustainable practices in combination with lean techniques. Recently one of us worked with the largest sandwich factory in the world. A team of great managers and shop floor staff set out to reduce waste. They used simple lean tools and techniques such as value stream mapping and A3 problem solving. They cut 1,000 tons of waste in just a few weeks in a very mature industry. They also saved nine million liters of water from going down the drain every year, and dramatically increased profits. The financial benefits were even more staggering.

However, there are several deeper paradigms that must be transformed before you can reap the benefits of combining lean and green. We have come across lean practitioners who have an unfortunate tendency to see environmental programs as a threat. Operational researchers came to a similar conclusion when they highlighted that complexity, measurability, and the social character of environmental problems may impose barriers to the interaction between operations and environmental management (Bloemhof-Ruwaard et al., 1995). Martínez-Jurado and Moyano-Fuentes (2014) identified a significant gap in research on social sustainability, especially in the area of *lean supply chain management*. This is pointless. Lean means doing more with less. Lean thinking supports green thinking and vice versa. So why are economic and environmental continuous improvements located in separate organizational silos and sometimes even in conflict with each other? Integrating them could be the biggest opportunity missed across most industries. There is much that the environmental movement can learn from the lean and quality community about people engagement, structures, and methods. Equally importantly, the lean community can find a new purpose and once again lead the continuous improvement of their organizations using environmental waste as a proxy for identifying key areas for economic progress.

### **What's the Size of the Opportunity for Realizing "the Environment is Free"?**

Western manufacturers have made enormous productivity gains over the past two decades and continue to draw on lean methods for doing more with less and to counter the sharp productivity decline in the late 1980s and claims that, at the time, all manufacturing jobs would soon be offshored to cheaper labor economies. According to the US Bureau for Labor Statistics, the manufacturing sector's indexed productivity doubled between 1992 and 2012 in terms of real output per hour of labor. According to BLS, the manufacturing sector's productivity in 1992 was 57.47 rising to 114.7 in 2012 in the United States (indexed to 2005). The manufacturing industry safeguarded millions of jobs by means of lean thinking, by adopting the new quality paradigm, and through the appropriate use of modern technologies to lower costs while enhancing value.

The macro- and microeconomic impacts of lean and the quality movement in preserving jobs and enhancing competitiveness are undeniable. However, the task is not complete. The "environment is free" movement offers huge opportunities to protect jobs against the continuing outsourcing trend, to fend off the more recent "robo-sourcing" trend (as termed by Al Gore in *The Future*, 2013), and to address critical challenges such as climate disruption. The "3% Report"

published recently by the World Wildlife Fund and Carbon Disclosure Project (2013) shows that the economic prize for curbing carbon emissions in just the US economy is \$780 billion between now and 2020 (net present value), rising to \$190 billion a year by 2020. It puts the return on investment (ROI) for lean and green interventions at 233 percent. In the authors' own experience, this is conservative. Most organizations can achieve ROI of 1,000 percent or even higher when adopting the right behavioral and managerial changes.

McKinsey & Co. (Choi Granade et al., 2009) showed that energy efficiency is the single largest source of energy in the US, worth \$130 billion per year. Some 47 studies from the likes of the Economist Intelligence Unit, Goldman Sachs, AT Kearney, Deloitte, MIT Sloan, and others show that companies that commit to such aspirational goals as zero waste, zero harmful emissions, and zero use of non-renewable resources are financially outperforming their competitors. Conversely, the DARA Group found that climate disruption is already costing \$1.2 trillion annually, cutting global GDP by 1.6 percent. Unaddressed, this will double by 2030 (DARA, 2012).

Nonetheless, far too many companies still delay creating lean and green business systems, arguing that it will cost money or require hefty capital investments. They remain stuck in the "environment is cost" era.

### Creating a Lean and Green Enterprise

In order to create a lean and green business system, there needs to be orchestration across all levels of managing an organization in order to balance efficiency gains and environmental friendliness in operations and products (Garza-Reyes, 2015). There is much more to creating a lean and green business system than just drawing upon a set of tools and techniques. Figure 17.1 demonstrates various aspects of creating a lean and green enterprise: strategy deployment, process management, supply chain collaboration, and leadership and people engagement. In what follows we discuss each area of the model through a short case study.

Toyota proved "quality is free." Can it prove that "the environment is free" too? The publication of *The Machine that Changed the World* in 1990 (Womack et al., 1990) was a wake-up



Figure 17.1 Creating a lean and green enterprise

call for most Western manufacturers. It benchmarked Japanese automakers against the rest of the world, showcasing Toyota's immense efficiency and quality lead over such Western car makers as GM and Ford. Toyota took only half as long as GM to manufacture a similar size vehicle, with a fraction of the inventory and a third of the defects (see Table 17.1). The term "lean," which was first popularized in the book, refers to Toyota's ability to do a lot more with substantially less. The Japanese had put "quality is free" into practice with ample proof that better quality did not cost more. In fact, it was far cheaper for the manufacturer, better appreciated by the customers and much more fulfilling for the employees. According to Kurdve et al. (2014), who investigated the integration between Toyota's specific lean-based improvement programs, such as the Toyota Production System (TPS), and formal management systems concerning the environment (EMS), quality (QMS), and occupational health and safety (OHS), incorporating environmental management systems into a company-specific production system (XPS) is an effective way towards continuous improvement, resulting in a holistic understanding and improved organizational performance.

More than 20 years after the publication of *The Machine that Changed the World*, we investigated if the cheapest and most efficient car manufacturers are also the "greenest." Responsible for 14 percent of all greenhouse gas (GHG) emissions worldwide (Stern, 2006), the transport industry has been pressed more than most other sectors of the economy to shift towards Kyoto Protocol target levels. Our research showed that Toyota—the holy grail of economic efficiency for decades—tops the green charts too (Zokaei et al., 2013). Industry benchmarks (Harbour Report, 2012) show that Toyota stays on the top of the economic performance charts for the same year (2012) in terms of productivity and quality. Table 17.2 illustrates a summary of our findings using

Table 17.1 Benchmarking of Toyota proved that quality is free

	GM Framingham, USA	NUMMI (Joint venture between Toyota and GM in Fremont, USA)	Toyota Takaoka, Japan
Assembly productivity (hours/car)	31	19	16
Assembly quality (defects/car)	135	45	45
Average inventory of parts (measure of delivery)	2 weeks	2 days	2 hours

Source: Womack et al. (1990, p. 83).

Table 17.2 Benchmarking Toyota's environmental performance vs main competitors

Year 2010	No. of staff	Revenue in \$m	No. vehicles produced	Tons CO <sub>2</sub> -e	Tons CO <sub>2</sub> / vehicle produced	Tons CO <sub>2</sub> / \$m sale
Toyota	320,808	222,000	8,557,351	7,334,000	0.86	33.0
GM	209,000	135,592	8,476,192	7,863,406	0.93	58.0
Fiat S.P.A.	190,014	72,200	2,716,286	2,663,645	0.98	36.9
Volkswagen	399,381	162,851	7,341,065	7,700,000	1.05	47.3
Ford	164,000	128,954	4,988,031	5,300,000	1.06	41.1
Honda	181,876	120,270	3,643,057	4,000,000	1.10	33.3
Daimler (Mercedes)	260,100	130,900	2,410,021	3,699,102	1.53	28.3

Source: Zokaei et al. (2013, p. 90).



different “key indicators” for benchmarking. We benchmarked the environmental performance of various incumbents in the industry from different perspectives. Clearly, there are various sources of GHG emissions during the end-to-end life cycle of an automobile and it is hard to measure any given company’s environmental performance, especially in an industry as complex as automotive.

Toyota has consistently reduced its total emissions, setting itself a target to cut emissions per unit of sales globally by 20 percent by 2010 against 2001 levels, and delivering 23 percent reduction from 2001 levels and 51 percent reduction from 1990 (Toyota Motor Corporation, 2011b).

No one familiar with the company is surprised. These improvements are rooted in its *kaizen* (continuous improvement) mentality. The day-to-day *kaizen* in Toyota is guided and driven by “five-year environmental action plans” that set tangible goals for all areas including production, facilities, transport, and offices, as well as specific regional targets for various plants. These targets are integrated into the company’s “strategy deployment” mechanism or “*hoshin*” planning, which aligns the organization from top to bottom.

Toyota believes that managers must delegate as much authority as possible:

That is the way to establish respect for humanity as your management philosophy. [Hoshin] is a management system in which all employees participate, from the top down and from the bottom up, and humanity is fully respected.

These are the words of Professor Kaoru Ishikawa, father of *hoshin* planning, in his book, *What is Total Quality? The Japanese Way* (1985, p. xiv).

Hoshin planning ensures that environmental goals are integrated into everyone’s working life. Across all Toyota plants, there are cascading measures in place at all levels, from the top board to operators, to discern the correct direction. As stated in an interview with Steve Hope, general manager of Environmental Affairs and Corporate Citizenship, Toyota Motor Europe in Zokaei et al. (2013), when opportunities are identified Toyota employees apply five key performance indicator (KPI) criteria which are, in order of priority: safety, environment, quality, production, and cost. Hoshin planning is so deeply rooted in the notion of “respect for people” that Toyota members often exceed their targets and deliver results which are much more sustainable than in any organization in which targets are enacted by means of control or even bonuses.

As shown in Table 17.2, Toyota emits the lowest “tons of CO<sub>2</sub> per vehicle manufactured”—certainly a key measure for benchmarking environmental performance across the automotive sector. Toyota also tops the ranking in terms of “tons of CO<sub>2</sub> per dollar revenue,” when Daimler (Mercedes), which predominantly assembles luxury vehicles sold at premium prices, is discounted. In this category, Toyota is closely rivaled by Honda and Fiat (which also owns luxury brands such as Ferrari, Maserati, and Alfa Romeo).

Toyota’s leanness and greenness stem from the same corporate values. In an interview with a Toyota executive, Steve Hope told us:

We have a role to exercise in relation to the society. We don’t think we can manufacture what we want to manufacture independently of the impacts on the wider society. Our philosophy is that we are an integral part of the environment and we are fulfilling a need of society which is the desire for personal transportation.

Toyota’s Guiding Principles, established in 1992 and available on Toyota’s corporate website ([www.toyota-global.com](http://www.toyota-global.com)), are also clear: “pursue growth in harmony with the global community through innovative management.”

Toyota's fifth Five Year Environmental Action Plan, the cornerstone of its sustainability commitment, begins with the following statement of purpose: "Contributing to growth of sustainable society and earth through *monozukuri*, co-existing with the global environment, making cars and offering quality products and services" (Toyota Motor Corporation, 2011a).

*Monozukuri* captures the true spirit of Toyota in relation to the concept of sustainability. The literal meaning of the word is "production." *Mono* is the thing which is made and *zukuri* means the act of making, but *monozukuri* implies more than simply making things. It can be best compared to the word "craftsmanship" in English, although in craftsmanship, the emphasis is on the craftsperson, whereas in *monozukuri* the person doing the making is de-emphasized and the attention is on the "thing" being made.

This subtle difference reflects the Japanese sense of responsibility for using "things" in production and their respect for the world around them, both animate and inanimate. In the Japanese tradition of *monozukuri*, the craftsperson takes great care using resources so as not to be wasteful. When an item or human effort is taken into use, there needs to be a benefit for the society as a result while, at the same time, the balance between production, resources, and society should be maintained.

*Monozukuri* is also about deeply respecting the individuals who do the job. As in craftsmanship, in *monozukuri*, workers "bring their mind to work" and are fully empowered and trained to deal with different situations, creating an elevated sense of ownership. There is no mindless repetition in *monozukuri*. Within Toyota, it is crucial for all workers not to be robbed of their right to "pride of workmanship" and to gain intrinsic satisfaction in what they do. In this concept, making products (or *monozukuri*) is also making people (or *hitozukuri*) because they are instilled with pride and passion for their jobs. Toyota's green vehicle technologies and other lean and green initiatives will not work without the full engagement of its people. Mutual trust, authority, empowerment, skills to make quality products, lifetime employment, and the inquisitive culture of *genchi genbutsu* (go see at workplace) are all tenets through which Toyota respects its people.

*Monozukuri*, therefore, is manufacturing that is in harmony with nature and is value-adding for the society. *You could even say monozukuri is the older sister of sustainable manufacturing.* Toyota's official website says:

Toyota has always sought to contribute to society through the *monozukuri* philosophy—an all-encompassing approach to manufacturing. In its application of *monozukuri* to the production of automobiles, Toyota has pursued a sustainable method of making its cars ever more safe, environmentally friendly, reliable and comfortable.

*(Toyota Global, 2015)*

Toyota's environmental performance is driven far more by its profound commitment to harmonious manufacturing (*monozukuri*) and its role in society as a value-adding corporate citizen, dating back to the precepts of the founding father, Sakichi Toyoda, than by environmental regulations. Derived from the founding fathers of Toyota, the company's core values stress a sense of duty to contribute to the development and the welfare of society at large rather than seeing the company just as a money-making machine. Compare this with the present day's banking culture!

## Conclusion

The starting point for creating a lean and green business system is the mindset of senior managers. It is hard to deliver the type of results we have seen from leading-edge organizations such as

Toyota, Marks & Spencer, Tesco, and Adnams without executive commitment to integrating these two approaches to achieve the dual benefit of improved economic and environmental performance.

A starting point is the understanding that there is no trade-off between lean and green, that lean and green should be brought together in a symbiosis, as Toyota has done with its monozukuri approach. The next step is to create a whole business approach that focuses on the needs of customers, the business, the employees, and wider society, all at the same time. In achieving this integration, there is a great deal we can learn from a similar paradigm shift that occurred during the 1960s and 1970s across the Western world as managers came to realize that there was no trade-off between quality and cost, i.e. the *total quality movement*.

This requires a coherent strategy that is well developed and well deployed across all levels of the business. It also requires that continuous improvement is seen to be about the reduction of not just the classic economic wastes but also environmental wastes such as pollutants, landfill, and excess resource usage. This will mean bringing lean people together with environmental teams in a common function and improvement process.

The bottom line remains that the environment is free; but it is not a gift.

### Case Study: Lean and Green in Adnams plc

*Leadership and people engagement* are the building block of creating a lean and green business system. Adnams plc, a UK-based brewery with a turnover of only around \$80 million, is a great example of putting lean and green leadership and people engagement at the heart of business. The Adnams story proves the central role that committed, inspirational leadership can play in making fundamental changes to business operations through engaging staff and facilitating a genuinely bottom-up approach. The company engenders an enviable and widespread dedication and commitment to sustainable business at all levels. Across the company, team members lend their support willingly because they see top management's thorough commitment to the vision of building a more sustainable company for the long term.

The company has a long-standing history of putting a strong set of social and environmental values at its heart. These values, combined with ongoing innovation, have not only enabled substantial improvements in terms of environmental performance, but also generated quantitative and qualitative business benefits, principally in the form of cost savings and brand development. For example, while the UK beer market remains in long-term decline, Adnams has almost doubled its beer volumes produced since starting its lean and green journey in 1999. In 2011 and 2012, Adnams grew volumes by 7 percent and 4 percent respectively. In terms of people engagement, the business received an 88 percent response rate to its last staff opinion survey. Of this 88 percent, some 92 percent of respondents said they were either proud or very proud to work for the company. 92 percent rated sustainability as the company's most important value and some 94 percent were clear or very clear about what is expected of them in their role.

The business does not specifically talk about *corporate responsibility* (CR) or *corporate social responsibility* (CSR) and holds the view that if these acronyms need to be used any organization is treating such matters as an adjunct and is not truly embedding the approach within its operations. Over the past decade the company has been an outstanding example of green business activity, considerably reducing its impact on the wider physical environment and increasing its positive social and economic returns. The business sequestered in excess of 500 tons of CO<sub>2</sub> by using crops in the design and construction of its distribution center which boasts a green roof. The use of food waste as an energy source within its

anaerobic digestion facility means that the business diverts 69,700 tons of CO<sub>2</sub> equivalent from landfill. In 2013, Adnams was on track to reduce its CO<sub>2</sub> emissions a further 6 percent. These and other environmental measures are reported to the main board of the company on a monthly basis.

Using innovative cutting-edge green technologies, Adnams has installed one of the most energy- and raw material-efficient breweries in Europe and constructed an eco-efficient distribution center (with the green roof described above); its anaerobic digester takes food waste from brewing, retailing, pubs, and hotels and turns it into bio-gas for injection into the national grid. The savings generated from not having to run any mechanical heating or cooling in its warehousing operation saves the business in the region of \$160,000 per year and the commercial anaerobic digestion facilities should generate revenues of around \$300,000. The joint venture company Adnams Bio Energy invested £1m (approx. \$1.5m), so a straight payback was expected to be about 3.3 years. The facility cost more than this, with the additional monies being provided by European Regional Development Fund (ERDF) providing grants of around £1.1m (\$1.65m) and the now defunct East of England Regional Development Agency (EEDA) providing a grant from its single pot of £900,000 (\$1.35m). The total project cost has been £3m (approx. \$4.5m).

It is the human element that drives the application of these ideas. The culture of the company encompasses value-based decision making from a deep conviction that long-term thinking and sustainability pays off. This has led to positive staff engagement in the whole process and a corporate-wide tenacity and determination to succeed. In 2012 the company won its second consecutive Queens Award for Sustainable Development in the United Kingdom. In 2013 it won the First Woman Award, a national competition run by the Confederation of British Industry (CBI), that recognized Adnams for the way it develops and progresses female careers. The person who collected this award on behalf of the company was Karen Hester. Currently the operations director for the organization, Karen used her skill, determination, and tenacity to progress from office cleaner to the boardroom during her tenure at Adnams, a further example of a progressive culture alive and well at Adnams that is working for the long term. According to the company CEO, the five principles of lean and green leadership at Adnams can be summarized as *value-based decision making, tenacity, challenge, proximity to workplace, and staff engagement*.

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