Torbjørn Netland & Daryl Powell (Eds.)
The Routledge Companion to Lean Management
Routledge, New York.
Shingo Research Award Winner 2017

Chapter 22 Lean Global Corporations

By Torbjørn Netland, ETH Zurich

Not to be distributed without permission.

Contact: Torbjørn Netland, tnetland@ethz.ch

© Routledge 2016

Chapter 22

Lean Global Corporations

Torbjørn H. Netland

ETH Zürich, Zürich, Switzerland

Introduction

If implementing a "lean" program at a single site is a challenge, imagine doing it in a network of sites. Multinational corporations are always looking for ways to improve the productivity of their operations. To that end, a popular strategy is to develop and deploy *corporate lean programs* in their networks. Instead of leaving every subsidiary to solve its own improvement issues, they offer a corporate template for the sites to implement. Today, companies spend billions of dollars to develop, deploy, manage, and maintain corporate lean programs. There is evidence that the programs can be very effective if implemented correctly, but the experiences in many corporations vary.

Corporate lean programs can take different forms. The most successful ones are tailored to the needs and characteristics of the firm (Womack and Jones, 1996; 2007). Rather than copying the programs of other companies, or buying a standard lean program from an external consultancy, the firm should invest time and money to develop something that fits its purpose. Inspired by Toyota's successful Toyota Production System (TPS), many firms develop their own "company-specific production systems" (or "XPS," where X stands for the company name, and PS for production system) (Feggeler and Neuhaus, 2002; Clarke, 2005; Netland, 2013). A few good examples of reportedly successful XPSs include the Alcoa Business System, Boeing Production System, Bosch Production System, Caterpillar Production System, Electrolux Manufacturing System, Nissan Production Way, Scania Production System, and Wiremold Production System. In practical terms, these examples are all corporate lean programs.

The rise of corporate lean programs

Developing and deploying corporate lean programs is an ongoing trend that is spreading far beyond its origin in manufacturing. The start of this trend coincided with seminal publications on lean production which appeared about 25 years ago (e.g., Krafcik, 1988; Womack et al., 1990). During the early 1990s, automobile companies realized that they needed a more holistic and company-wide approach to lean programs than the scattered, ad hoc and project-based

attempts of implementing "just-in-time," which they had attempted since the 1980s (Barthel and Korge, 2002). For example, Chrysler's introduction of the Chrysler Operating System in 1994 was one of the early corporate lean programs developed for a multi-site network (Clarke, 2005). Almost all automobile OEMs developed their own tailored lean programs in the 1990s, and many suppliers to the car manufacturers soon followed. In the 2000s, the trend spread to companies in process industries and to manufacturers of mechanical and electrical equipment. During that decade, corporate lean programs became more and more common among global firms in industries that produce high-volume physical products: furniture makers, home and office appliance manufacturers, the food and retail industry, publishing houses, and so on. Since 2010, corporate lean programs have also become popular in the construction industry, in various service industries (banks, insurance companies, law firms, etc.), and in public service and healthcare firms. The increasing spread of lean programs beyond discrete production hints that they are effective.

Why do more and more firms develop corporate lean programs? A primary objective of such programs is that they *put improvement into system*. Whereas companies have always had systems in place for creating value for customers (admittedly to varying degrees), they have traditionally lacked structured systems for creating *more* value for their customers tomorrow than they do today. Improvement has been left to scattered initiatives and chance. The ability to make continuous improvements is what really sets Toyota apart from its competitors (Spear and Bowen, 1999; Liker, 2004). Having a corporate lean program sets a direction and provides marching orders for the improvement of all sites in the network.

A second objective of corporate lean programs is to align improvement activities across different sites and departments. Organic growth, and mergers and acquisitions are resulting in larger and more complex companies with manufacturing facilities and service offices spread across the globe. A result is often varying performance levels and uncoordinated ad hoc improvement projects. A shared corporate lean program can effectively help control, coordinate, and align the improvement efforts in big firms. For example, DaimlerChrysler developed its common DCPS immediately after merging in 1999 in order to align its production methods. Another example is the Volvo Group. After acquiring majority shares in Mack Trucks in the U.S., Renault Truck in France, Nissan Diesel in Japan, and some other firms, the Group launched the Volvo Production System in 2007 with the purpose of streamlining operations and improving productivity on a global scale (Hill, 2006). By codifying improvement principles

and practices, a corporate lean program is helpful for effectively sharing knowledge about productivity improvement across sites, cultures, and borders.

Yet many firms have yet to take advantage of the benefits a corporate lean program can provide. In industries with widespread implementation of lean programs, simply having one is arguably necessary for achieving competitive parity (Netland and Aspelund, 2013). In industries that are new to lean thinking (e.g. healthcare, and low-volume engineer-to-order industries), early-starters can take advantage of a temporary competitive advantage. Late-starters in any industry can achieve a competitive advantage if they develop a better lean program than their competitors develop, and/or if they implement it at a faster speed than their competitors implement it. This does not mean that a lean program is the answer to every problem. It is not. It only posits that if a company uses its own corporate lean program to put improvement into a system, it will probably be more productive than if it did not have a program. For that reason, I believe we will see the trend of corporate lean programs continue to grow in the future.

What is a corporate lean program?

A corporate lean program is a productivity improvement program developed specifically for a corporation. Importantly, it differs from improvement projects in its intention of being permanent. In multinational companies, it is a shared system for all sites. A corporate lean program is often manifested in a company-specific production system. The use of the company's name and corporate design shows that the system is "ours," in the same way that the TPS is Toyota's system. A graphic model often summarizes the chosen principles (e.g. a house at Toyota, a temple at Chrysler, or a pyramid at Volvo).

When developing their own lean programs, multinational companies choose and adapt principles from available production improvement templates, such as total quality management (Deming, 1982), just-in-time production (Sugimori et al., 1977; Ohno, 1988), the theory of constraints (Goldratt and Cox, 1984), world class manufacturing (Schonberger, 1986), business process re-engineering (Hammer and Champy, 1995), mass customization (Pine, 1993), Six Sigma (Pande et al., 2000) and, most notably, lean production (Womack et al., 1990). There is no doubt that the famous TPS has been an inspiration for other firms.

An analysis of the company-specific production systems of 30 renowned multinational firms found that key principles of TPS and lean production were common among all the programs

(Netland, 2013). That study found that the most common principles were "standardization," "continuous improvement/kaizen," "quality focus," "pull production," "flow/value stream/customer orientation," "employee involvement," "visualization," "stable processes," and "workplace organization". All of these are well-established lean principles (Womack and Jones, 1996; Liker, 2004). Other studies confirm that companies' different systems and "houses" are essentially corporate lean programs (Hofman, 2000; Feggeler and Neuhaus, 2002; Clarke, 2005; Lay and Neuhaus, 2005; Lee and Jo, 2007). Companies seem to develop their corporate lean programs by choosing the principles that best suit their needs from a broad pallet of proven lean production principles.

Although lean programs in different firms may look like exact copies, very few corporate lean programs do in fact contain the same principles. Even if the principles stem from the same templates, tailoring to the unique needs of the firm takes place when the program is developed. Not all firms choose all the technical principles found in lean literature. The argument is that not all lean principles suit all companies. The strength of developing a unique corporate lean program is that it allows for this specific adaptation.

A firm can (and should) include company-specific elements when it develops its lean program. For example, Volvo, which is known for its focus on attractive workplaces and on teamwork, has emphasized these elements with a "teamwork" principle in its Volvo Production System; Electrolux, which competes in the fast-cycling household appliances business, includes "design for manufacturing" in its Electrolux Manufacturing System; and Virginia Mason, a pioneering hospital in Seattle, includes "service (creating an extraordinary patient experience)" in its Virginia Mason Production System. These adaptations of the TPS principles to the situation at hand are critical for the success of the corporate lean program.

The effect of corporate lean programs

A big question is whether corporate lean programs are effective and whether they provide a positive return on investment. Borrowing a quote from Shiego Shingo, one of the key influencers of the TPS, my answer to the question is as follows: "The medicine works...but only if the patient takes it" (Shingo, 1986). There is a staggering amount of research into the effect of implementing lean and related improvement practices. Empirical studies have evaluated the effect on performance of implementing just in time, total quality management, total productivity maintenance, Six Sigma, and corporate lean programs. The research evidence is clear—

companies that succeed in implementing these programs and practices outperform their peers in terms of operational performance.

Many practitioners are not always convinced by the research: "OK, on average, the corporate lean programs seem to help the companies that have been studied, but that does not mean this would work for us!" Pointing to unique characteristics of their companies, markets, or strategies, they believe they need something "smarter" or more exclusive. However, the ongoing migration of lean thinking across industries shows that lean can be useful under a wide variety of circumstances. It is not likely that lean would have continued its growth and spread over the last three decades if it was a faddish trend. There is an abundance of anecdotal evidence from companies across many different industries that lean programs help improve performance, both from the companies' own reports and in the popular literature.

An in-depth study of the implementation of the Volvo Production System in 67 plants in the global Volvo Group revealed that as a plant progresses in its implementation of lean, its operational performance improves slowly at first, then grows rapidly, and finally tapers off—essentially following the shape of an S-curve (Netland and Ferdows, 2014; Netland and Ferdows, 2016). The initial stage can be characterized by "exploration," during which the plant is discovering and experimenting with lean principles, and the later stages by "exploitation," during which the plant is realizing their benefits (see Figure 1). The exploration phase does not lead to radical performance improvements at the plant level (although good results can be achieved quickly in pilot areas); thus, organizations must be patient when they launch a lean program. At Volvo, we observed that plants that were "beginners" to lean needed a minimum of two years to move to the "in transition" stage where benefits could be reaped (later, the plant could progress to the "advanced" and "cutting-edge" stages). Our findings support the opinion of Womack and Jones (1996), p. 148, who wrote: "Three years is about the minimum time required to put the rudiments of a lean system fully in place, and two more years may be required to teach enough employees to see that the system becomes self-sustaining."
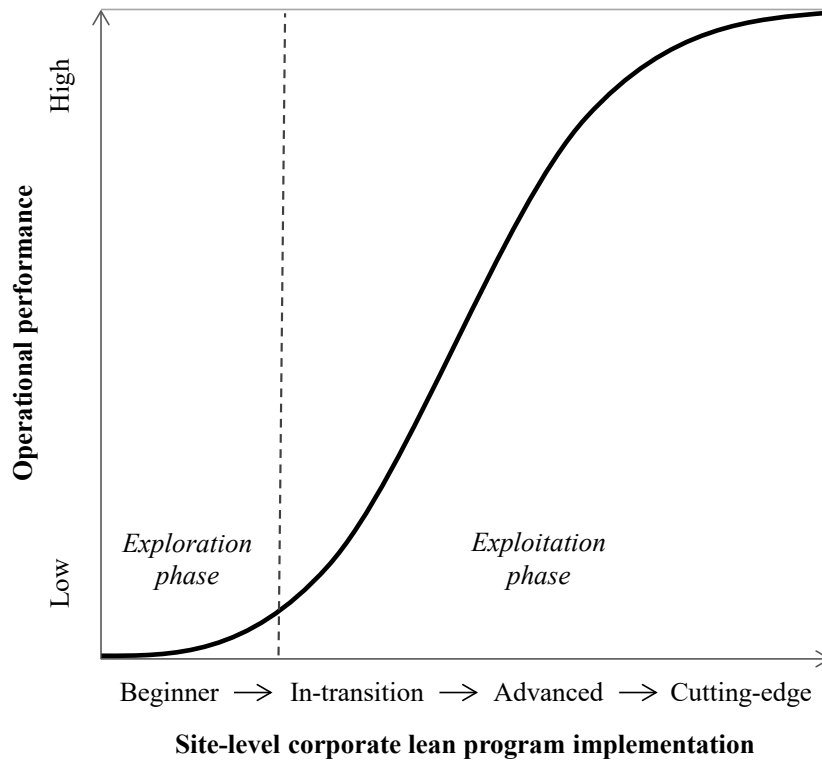
Figure 1. The S-curve effect of implementing corporate lean programs (Netland and Ferdows, 2016).

Implementing corporate lean programs

Of course, just having a lean program and a "house" described in presentations and strategy documents does not improve anything. Without implementation, strategies are not really adding value. Perhaps a note on the word "implementation" is useful here. Many lean authors and practitioners argue that the word "implementation" gives the wrong impression. Lean cannot be "implemented," they claim, because lean is not like software or technology, but rather, is "a journey" or "a way of living." Although I see the point and agree that there is no end point to lean, I believe the word "implementation" is useful for companies that are looking for ways to improve their operations. When I use "implementation" in this chapter, I refer to all activities related to improving operations using lean philosophies, principles, and practices.

In research that I have conducted at several multinational corporations, I have investigated which *specific managerial actions* assist in the implementation of a corporate lean program (some results are reported in Netland et al., 2015). Managers encounter a number of questions in their lean journeys that call for decisions and actions. This chapter does not intend to address all of these questions, but rather, touch on a few topics that always seem to pop up. They are:

- What type of leadership is needed?

- How should the organization be trained in the lean program?

- Is there a need for local lean coordinators and "lean teams"?

- How can progress be tracked and monitored using corporate lean assessments?

- Can implementation be facilitated using local top-down or bottom-up reporting structures?

- Can financial or nonfinancial incentives assist in implementation?

- To what degree is corporate governance needed?

Lean leadership

Developing a corporate lean program is the easy part; the hard part is implementing and sustaining it. Luckily, after 25 years of trial and error in many firms, we now know quite a bit about what it takes to succeed. On the downside, however, it is not a quick fix. First and foremost, it takes a particular form of *leadership* (Spear, 2004; Liker and Convis, 2011; Ballé and Ballé, 2014). Leaders must not only stay committed to the corporate lean program for a long time, they often also need to change behaviors to reflect a more supportive style. Why? Leaders cannot implement a lean program alone; success is fully dependent on the participation of the front-line employees. The primary job of a lean manager is to motivate and enable the workforce to integrate lean thinking and continuous improvement in their jobs. There are a number of recent books on lean leadership (see, for example, Ballé and Ballé, 2009; Rother, 2010; Liker and Convis, 2011; Ballé and Ballé, 2014; Liker and Trachilis, 2014; Mann, 2014), so I will not go into further detail here.

Training programs

One of the first questions managers have after launching a new lean initiative is how to spread "the knowledge". Training must start in the boardroom, because if top management is not aware of the purpose and basics of the program, they are not likely to stay committed to it beyond the kick-off event. Ideally, the knowledge should spread in the organization via an on-the-job, train-the-trainer model. However, this model is admittedly slow, and most organizations therefore launch corporate training programs. Good training programs consist of a mix of eLearning, classroom training (including simulations and games), project assignments, and on-the-job training.

To motivate employees to undergo training, some organizations have adopted the "belt" programs that are commonplace in the Six Sigma methodology. Employees progress through a hierarchy of yellow belt, green belt, black belt, and master black belt. This practice has led to an attractive business model in consultancy; many firms offer training programs, certifications, and accreditation services in lean, Six Sigma, and the like. Although belt programs and accreditations can create motivation, there is also a risk of creating a non-value-adding bureaucracy that does not contribute sufficiently to the true objective of the lean program: process improvement.

Local lean coordinators and teams

In our research, we found that lean teams and coordinators play an important role in the implementation of a corporate lean program. The usual criticism of them is that they disconnect the rest of the employees from engaging in the lean program. Instead, we found that the teams serve a coordinating role. They help employees learn about lean principles, and they support them in improvement activities. Lean teams can employ experts with deep knowledge of lean methods such as value stream mapping, problem-solving tools, and workplace organization ("5S"), which is necessary in lean transformations.

There is admittedly a risk that lean teams could turn into bureaucratic, non-value-adding departments that mainly report lean implementation upwards for compliance reasons (many plants have seen that happen). To avoid this risk, managers must carefully consider the size and composition of their lean teams. A rule-of-thumb is one member per 150 factory employees. However, more important than the number of members, is the competence, people-skills and drive of those employed. Also, managers should carefully consider the lean implementation stage that the plant is currently in. In the beginner stage of a lean journey, the team—supported by the leadership—is the "driver" for implementation. As the plant progresses to the in-transition stage, the team should take the role of a "trainer," and as the plant matures in its journey into the advanced stage, the role changes again into that of a "facilitator". Finally, if the plant gets to the cutting-edge stage, the team's role should be to "mentor."

Corporate lean assessments

Lean assessments are a central part of many corporate lean programs. Their purpose is to evaluate the degree to which lean is "implemented" in a business unit, and thereby identify areas for further improvement. On a corporate level, assessments gauge the overall lean

implementation progress. There is little doubt that lean assessments can be useful, but managers should not take a quick approach to them. Few aspects of corporate lean programs create as much frustration and unfruitful discussions as lean assessments. These assessments often backfire. Poorly designed and performed assessments are upsetting and demotivating, rather than energizing and motivating.

There are many ways to design and conduct lean assessments, ranging from simple self-assessment templates to extensive audits carried out by a professional third party. A typical middle ground is the "corporate lean assessment," where a corporate team of experts, external to the units assessed, but internal to the organization, carry out the assessment. A corporate lean assessment uses a detailed scoring card to assess the level of implementation of the lean program in a unit. It is usually a spreadsheet table with lean practices in the rows and scoring levels in the columns. The most common scoring scheme is to use five scoring levels ranging from "not implemented in any areas," to "fully implemented in all areas," with or without detailed explanations of each level of maturity. An individual assessor or a team of assessors performs the assessments. Multinational corporations often have a dedicated team of expert assessors that travels to the units and performs assessments on a regular interval (ranging from six to 36 months). The assessment typically lasts one day or up to five days, depending on the preparations, depth of assessment, and size of the unit. In between the regular corporate lean assessments, the units can use the scoring scheme for self-assessments to track and push local implementation.

Corporate lean assessments have two major purposes: on the one hand, the assessment assists corporate managers in keeping track of their progress in lean implementation across multiple units. On the other hand, assessments should create motivation—and offer assistance—for further implementation in the units. An assessment also has other benefits. It communicates the importance of the program. It provides an excellent opportunity for learning, collecting success stories, and celebrating achievements. It also helps assimilate lean implementation among sites and thereby ease communication and sharing of standards and best practices. There are clearly many benefits to assessments, but often, the disadvantages outnumber the benefits. The corporate lean program office should not be carried away by the opportunity to "travel the world and 'manage' the implementation of lean in distributed sites" by conducting assessments. Table 1 summarizes the main pros and cons of corporate lean assessments.

Table 1. Pros and cons of corporate lean assessments.

Pros	Cons
+ Check implementation progress	- Cost of assessment
+ Create motivation	- Added bureaucracy
+ Provide a roadmap for implementation	- Management of assessment
+ Communicate importance	- Risk of compliance focus
+ Create learning opportunities	- Lack of relevance
+ Collect success stories	- Risk of bias toward assessment-friendly aspects of lean (tools and techniques)
+ Create opportunities for celebration	- Lack of local ownership
+ Assimilate lean implementation among sites	- Risk of demotivation (not-invented-here)

Top-down and bottom-up performance reporting

To check the implementation progress at the local site, many managers employ different forms of top-down audits. The most common example is the 5S audit, which is a checklist of elements that should be implemented in an area for each of the five "Ss": sort, set-in-order, shine, standardize, and sustain. In our research, we found that such audits *do not* have a motivating effect on the further implementation of the lean program (Netland et al., 2015). Audits may be useful for knowing where you are (which is a prerequisite for improvement), and can help maintain attention to the lean program, but managers should not expect audits to advance the lean implementation in a specific area. An exception was plants that were in the beginner phase, for which the audits had two major advantages: first, managers who were visible on the shop floor during the audits showed commitment, and second, the audits were helpful for employees who needed to learn the elements of the lean program. The need for top-down audits signals that the plant has not achieved a self-sustaining improvement culture. The following quote from a manager captures this idea well: "We need to go from a *push-based* implementation to a *pull-based* implementation" (c.f. Netland et al., 2015).

Different from top-down performance reporting, bottom-up daily operations meetings have a positive effect on lean program implementation. The meetings focus on a balanced set of performance measures and are conducted regularly as part of the daily operations. They are held on the shop floor, performed standing-up, and do not take longer than five to 10 minutes. These short meetings help everyone in the unit to be up-to-date on the latest progress and problems, every day. These meetings can create a "pull" for implementation. It is not enough, however, to call for short meetings in front of visual boards every morning; there is a huge

amount of variance in how these meetings are conducted and in how effective they are. The best practice is when every employee comes prepared and contributes to solve problems. At the other end of the scale are the meetings where a manager stands at the board and dictates the work plan of the day. The best way to create effective bottom-up performance reviews is to start holding meetings, and continually improve them using the Deming PDSA cycle (plan, do, study, and act).

Incentives for implementation

A usual practice in any change program is to offer incentives for implementation. Financial rewards, or "pay for performance," are some of the strongest incentive mechanisms that exist in the business world. Many managers strongly believe that they can motivate employees to "implement lean" by offering financial rewards in the form of money or expensive goods and services. These managers, however, rarely succeed with their programs. The problem with using financial rewards is not that it does not work; it does. The problem is that it only has a temporary effect. After a while, people take the "extra money" for granted, and it loses its motivational power. Any reduction in the rewards can have a destructive effect on the lean program. Financial reward programs also have other negative side effects: people argue fiercely about the way the rewards are calculated and distributed, and the added bureaucracy is not creating value for the customer. Of course, management should share the financial gains from the lean program with all employees, but not by connecting financial rewards to the lean program. Rather, they should share the gains through investments in the site (e.g., in the cantina, wardrobes, and equipment), end-of-the-year bonuses, or a general increase in salaries.

Another type of incentive system is non-financial rewards. Non-financial rewards can be any positive attention that does not involve a substantial monetary element. Some examples are praise and recognition from a senior manager or peers, a diploma, a free lunch, or a simple prize such as flowers. Nearly every employee appreciates being seen and recognized for good performance. For example, when workers bring home flowers and explain to their spouse and children that the gift was given to acknowledge extraordinary performance, the goodwill that is generated is likely to have a positive effect on the lean program implementation. Companies can also foster friendly competition among different areas by using non-financial rewards. One particularly effective form of recognition is when senior managers come to the shop floor to learn from front-line personnel and acknowledge their improvements. By linking some form of

nonfinancial reward to the lean program, managers communicate the importance of the program and encourage employees to pay attention to it.

Local autonomy versus global coordination

A recurrent question in discussions about improvement programs is the balance between global control and coordination versus local autonomy (Prahalad and Doz, 1987; Netland and Aspelund, 2014). Plant managers may fear that something they do not need is being imposed from above, and corporate managers believe the plants will not improve efficiently without a coordinating program. Obviously, there is no fixed point on the continuum from full local autonomy to full corporate control that is right for all sites, at all times, in a network.

Companies need both control and autonomy, and they can coexist. For example, Colotla et al. (2015) described how Procter & Gamble differentiates between "hard" and "soft" points for implementation of their program. The hard points are mandatory for all sites. The soft points are guidelines and recommended practices, but they are not mandatory. A practical example is the daily operations meeting on the shop floor. While the meetings and a few important key performance indicators (KPIs) are hard points, how the meetings are conducted, which other KPIs should be tracked, and which tools to use (whiteboard or computer) are soft points.

The future of corporate lean programs

Corporate lean programs can be an effective way to spread lean thinking in a multinational company. Their purpose is to improve productivity across all sites, and both research and practice show that companies can indeed achieve substantial improvements through these lean programs. Just as value-creating activities are codified and standardized, improvement of the same activities cannot be left to chance and random initiatives.

Importantly, corporate lean programs are not intended as one-off projects, but rather, as lasting strategic initiatives. Many firms carry out countless ad-hoc and temporary production improvement projects that do not lead to sustained performance improvement. In contrast, the corporate lean program has no end point. It sustains the emphasis and focus on lean thinking across the global network for a long period. Since a significant investment is required to develop a lean program, it must come with managerial support and attention from the corporate level. Lean initiatives that do not have the same support from the top are not likely to be sustained.

Corporate lean programs also have other benefits. They are tailored to the needs of the corporation and create a common "improvement language."

Whether a specific corporate lean program in a company will be successful or not, however, is a different story. A corporate lean program is a serious investment that pays off if done correctly, but it is not easy. If there is one factor that decides whether a company makes it or breaks it, it is leadership.

References

Ballé, M. and Ballé, F. (2009). *The Lean Manager: A Novel of Lean Transformation*, Lean Enterprises Inst Inc.

Ballé, M. and Ballé, F. (2014). *Lead With Respect: A Novel of Lean Practice*, Lean Enterprises Inst Inc.

Barthel, J. and Korge, A. (2002). Implementierung Ganzheilicher Produktionssysteme als Aufgabe des Managements - Ergebnisse einer Studie in Brownfield-Werken der Automobilindustries. *In:* Feggeler, A. and Neuhaus, R. (eds.) *Ganzheitliche Produktionssysteme - Gestaltungsprinzipien und deren Verknüpfung.* Köln: Wirtschaftsverlag Bachem.

Clarke, C. (2005). *Automotive production systems and standardisation: from Ford to the case of Mercedes-Benz,* Heidelberg, Physica-Verlag.

Colotla, I., Keenan, P. and Spindelndreier, D. (2015). The power of production systems: Unlocking lean in decentralized organizations. BCG.

Deming, W. E. (1982). *Out of the crisis,* Boston, Massachusetts Institute of Technology.

Feggeler, A. and Neuhaus, R. (eds.) (2002). *Ganzheitliche Produktionssysteme - Gestaltungsprinzipien und deren Verknüpfung,* Köln: Wirtschaftsverlag Bachem.

Goldratt, E. M. and Cox, J. (1984). *The goal: excellence in manufacturing,* Croton-on-Hudson, N.Y., North River Press.

Hammer, M. and Champy, J. (1995). *Reengineering the corporation: a manifesto for business revolution,* London, Nicholas Brealey.

Hill, B. (2006). *The Volvo Production Systems pre-study results* [Online]. Gothenburg: Volvo Technology. Available: http://goo.gl/1mmZc [Accessed 4 April 2010].

Hofman, A. (ed.) (2000). *Arbeitsorganisation in der Automobilindustrie - Stand und Ausblick,* Köln: Wirtschaftsverlag Bachem.

Krafcik, J. F. (1988). Triumph of the lean production system. *Sloan Management Review* 30(1) p. 41-51.

Lay, G. and Neuhaus, R. (2005). Ganzheitliche Produktionssysteme (GPS) - Fortführung von Lean Production? *Angewandte Arbeitswissenschaft* 42(185) p. 32-47.

Lee, B. H. and Jo, H. J. (2007). The mutation of the Toyota Production System: adapting the TPS at Hyundai Motor Company. *International Journal of Production Research* 45(16) p. 3665-3679.

Liker, J. and Convis, G. L. (2011). *The Toyota Way to lean leadership: Achieving and sustaining excellence through leadership development*, McGraw-Hill.

Liker, J. K. (2004). *The Toyota way: 14 management principles from the world's greatest manufacturer,* New York, McGraw-Hill.

Liker, J. K. and Trachilis, G. (2014). *Developing lean leaders at all levels: A practical guide*, Lean Leadership Institute Publications.

Mann, D. (2014). *Creating a lean culture: tools to sustain lean conversions*, CRC Press.

Netland, T. H. and Ferdows, K. (2014). What to expect from a corporate lean program. *MIT Sloan Management Review* 55(3, Summer) p. 83-89.

Netland, T. H. (2013). Exploring the phenomenon of company-specific production systems: One-best-way or own-best-way? *International Journal of Production Research* 51(4) p. 1084-1097.

Netland, T. H. and Aspelund, A. (2013). Company-specific production systems and competitive advantage: A resource-based view on the Volvo Production System. *International Journal of Operations & Production Management* 33(11/12) p. 1511-1531.

Netland, T. H. and Aspelund, A. (2014). Multi-plant improvement programmes: A literature review and research agenda. *International Journal of Operations & Production Management* 34(3) p. 390-418.

Netland, T. H. and Ferdows, K. (2016). The S-curve effect of lean implementation. *Production and Operations Management* 25(In press).

Netland, T. H., Schloetzer, J. D. and Ferdows, K. (2015). Implementing corporate lean programs: The effect of management control practices. *Journal of Operations Management* 36(0) p. 90-102.

Ohno, T. (1988). *Toyota production system: beyond large-scale production,* New York, Productivity Press.

Pande, P. S., Neuman, R. P. and Cavanagh, R. R. (2000). *The Six Sigma way: how GE, Motorola, and other top companies are honing their performance,* New York, McGraw-Hill.

Pine, B. J. (1993). *Mass customization: the new frontier in business competition,* Boston, MA, Harvard Business School Press.

Prahalad, C. K. and Doz, Y. (1987). *The multinational mission: balancing local demands and global vision,* New York, Free Press.

Rother, M. (2010). *Toyota kata: managing people for continuous improvement and superior results,* New York, McGraw-Hill Professional.

Schonberger, R. J. (1986). *World class manufacturing: the lessons of simplicity applied*, ASQC Quality Press.

Shingo, S. (1986). *Zero quality control : source inspection and the poka-yoke system,* Cambridge, Mass., Productivity Press.

Spear, S. (2004). Learning to lead at Toyota. *Harvard Business Review* (May.

Spear, S. and Bowen, H. K. (1999). Decoding the DNA of Toyota Production System. *Harvard Business Review* 77(5) p. 95-106.

Sugimori, Y., Kusunoki, K., Cho, F. and Uchikawa, S. (1977). Toyota production system and Kanban system Materialization of just-in-time and respect-for-human system. *International Journal of Production Research* 15(6) p. 553 - 564.

Womack, J. P. and Jones, D. T. (1996). *Lean thinking: banish waste and create wealth in your corporation,* New York, Free Press.

Womack, J. P. and Jones, D. T. (2007). *Lean solutions: how companies and customers can create value and wealth together,* London, Simon & Schuster.

Womack, J. P., Jones, D. T. and Roos, D. (1990). *The machine that changed the world,* New York, Rawson Associates.