



HAL
open science

Tricolore

Michael Ballé, Godefroy Beauvallet, Florian Magnani

► **To cite this version:**

Michael Ballé, Godefroy Beauvallet, Florian Magnani. Tricolore. The Cambridge International Handbook of Lean Production, 1, Cambridge University Press, pp.529-548, 2021, 10.1017/9781108333870.023 . hal-03349368

HAL Id: hal-03349368

<https://hal.science/hal-03349368v1>

Submitted on 8 Apr 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Tricolore: Traditionalists, Taylorists and Toyotists and the Historical Perspective of Lean in France

Michael Ballé, Godefroy Beauvallet and Florian Magnani

Introduction

Lean development in France reflects in many ways the spread of lean all over the world, with some local specificities. France's enduring national automotive industry has led very early pioneers to discover Toyota's uniqueness and appreciate the transformative potential of the *Toyota Production System* (TPS) well before the term "lean" was coined. French companies then pursued the usual forms of lean, from "automotive" lean, to traditional consulting cost-saving programs disguised as lean to genuine transformational efforts to understand and adapt the TPS in local conditions. Lean in France has also had some specific French offshoots, such as an obsession with "autonomous teams" and "liberated company" (Getz and Carney 2016), that can be traced to socio-technical system approach of the Tavistock Institute. More recently, France stands out as the home of several CEOs that have adopted lean as their main business strategy, with very visible results in difficult market conditions and a high labor cost context. Lean and its application in French companies then seems to have become multifaceted, based on continuous and structured learning (M. Ballé et al. 2006), but also apprehended according to several theoretical frameworks to gradually lead to a richer understanding for researchers (M. Ballé et al. 2017). This chapter introduces the historical development of lean in France and, through an analysis of the lean adoption, the three main perspectives French companies adopted.

Historical Development

Take One: Emergence

Lean has a long history in France. All the way back to 1975, Freddy Ballé, then Product Planning Head at Renault first visited a Toyota plant. He was stunned to see that the line produced the same number of cars that a French line would, about 600 a day, with half the staff (F. Ballé 2016). And he also had the very lean experience of not understanding where the productivity difference came from. For instance, they would follow car doors from stamping to welding not seeing anything different from what they did. It took them several visits to realize that when in France the door panels would transit through a warehouse, in the Toyota factory they went straight to welding. This example taught him a valuable lesson: you don't see what you're not looking for. The plant looked crowded with parts because there was no central warehouse (Chabiron 2018).

Meanwhile, Peugeot (PSA), the rival automotive company, after acquiring Citroen, got enthusiastic about Japanese automotive methods. In 1976, Jean-Paul Parayre, Peugeot's CEO, visited Japan with other committee executives to discover Japanese success methods. They came back with just-in-time in order to minimize costs associated with inventories. In 1982, Jacques Calvet, the new CEO, visited again Japanese manufacturers, and returned enthusiastic about the just-in-time its related productivity opportunities: automatic detection of production abnormalities and andon cords which represented the first visible component of jidok: automation with a human touch. After his meeting with Soichiro Toyoda, then Toyota's CEO, he also became a shu-ha-ri believer (*shu* is translated as "embrace the rules", *ha* is translated as "bend the rules", and *ri* is translated as "transcend the rules"), a new way to approach learning (Loubet 1990; Frerejean 2006).

In the early eighties, all automakers looked at Toyota in earnest. In 1983, Citroën launched a program, *Plan Mercure*, designed by the company's operational staff (Loubet 1998): standardization of production flows, inventory reduction, increase in machine availability times, jidoka, etc.... All this embodied Toyota's "zero stock, zero delays, zero defects", while

including a social aspect of prime importance. Xavier Karcher, Citroen's CEO, called on a Japanese expert, Professor Shigeo Shingo, to engage the company in Total Quality Management. He lectured on Toyota's current methods, in particular the constant efforts towards improvement and people development through creativity (Frerejean 2006). He insisted that each operator be expected to coordinate with his upstream colleagues as suppliers and downstream as customers. This led to, in 1985, the establishment of Quality Circles, focusing on both technical and human topics, accelerated this evolution. Efforts to improve productivity, product quality and working conditions appeared at the core of the company's discourse.

Throughout the eighties, early pioneers sought out the secrets of the *Toyota Production System* and conducted experiments here and there, mostly connected to the auto industry (Boyer and Freyssenet 2000; Jacot 1998). Most of these experiments succeeded locally but were abandoned one after the other as the deep-set French industrial system could not accommodate the necessary changes. Nonetheless, documentation about TPS started to appear here and there. A revised version of a Toyota 1973 handbook was translated into French and photocopies were circulated into automotive industrial circles as the "Toyota Method." In 1986, Jean Bounine, an engineer, co-authored a book on producing Just-in-Time with Kiyoshi Suzuki (Bounine and Suzuki 1986), and followed up with the publication of Taichi Ohno's *Toyota Production System* in French (Ohno 1989). A year later in 1991, Benjamin Coriat, a French academic specialized in work organizations published an insightful study of the TPS, aptly named *Thinking Upside Down* (Coriat 1991) which, as many of these very early books, accurately captured the disruptive nature of lowering inventories from increasing flexibility – and the associated productivity and quality gains.

Such early observers clearly saw the strategic impact of small batch production in terms of better fit to market (only producing cars as they are sold, rather than creating vast inventories of finished products, and then discounting them to move the metal). In Renault, Freddy Ballé

experimented with the head of engineering at the time to sequence assembly operations in order to be able to build different models on the same line – as he'd seen in Toyota (F. Ballé 2016). The experiment was successful, but never pursued further. Pioneers also saw how small-batch production revealed hidden problems and thus led to increased quality (in a small batch, first part has to be good otherwise you waste too many materials) and machine maintenance (machines have to be available at all time) as well as labor productivity (optimizing movements to be able to handle different work contents according to what was scheduled on the production line). Finally, they also realized how Toyota's "milkrun" approach to pulling parts from local suppliers changed the whole industrial setting, but never succeeded in setting up a similar system in France where suppliers were traditionally expected to deliver *to* their customers, as opposed to customers pulling *from* suppliers several times a day.

By the end of the eighties, these ideas had attracted a following. For instance, in 1989, Masaaki Imai was invited to conduct a seminar on Kaizen for Renault executives, and Renault created an Institute of Quality to capture and promote the Japanese Total Quality approach (Hermel, Edgeman, and Dahlgaard 1999; Hermel 1997). Kaoru Ishikawa visited France five times between 1978 and 1986 to promote quality learning and problem solving. A French Association of Quality Circles (AFCERQ) was created in 1988, and grew a network a network of up to 40,000 quality circles to its credit in 1987 – and then closed for financial reasons. Enthusiasm for Japanese methods and Total Quality led to a fervor for quality and productivity lean tools, such as Single-Minute Exchange of Die (SMED) or Total Productive Maintenance (TPM) and early internal and external consultants teaching them on an ad hoc basis. These experiments, as spectacular as they were, remained curiosities (troublesome curiosities at times) because the tools invariably delivered surprising productivity improvements, which the industrial system as a whole did not know what to do with and could not absorb – leading to both disappointment and frustration (Belekoukias, Garza-Reyes, and Kumar 2014). This "stop-

and-go” pattern, though not specific to France, would remain the most common experience with lean of French operators, managers and executives, well into the 21st century.

The early nineties completely changed the trajectory of lean in France. In 1989, Toyota founded its first European transplant in the UK, with the first cars rolling off the line in 1992, and as it set up it attempted to create the network of suppliers it had in Japan. Meanwhile, in 1987, Noël Goutard had taken over as CEO of an ailing diversified group called Valeo. The group supplied essential components to both French automotive giants Renault and Peugeot but was suffering from poor performance. Goutard set upon a rationalization of the industrial base and a rapid expansion. This growth strategy was successful, but also put the group deeply in debt by the early 1990s, at which point Goutard had concentrated all activities in the few automotive markets where the group was number one or number two, à la Jack Welch (Haour 2004). Goutard, very much an outsider in French technocratic engineering circles (he went into business with a law degree) sought non-traditional ways to consolidate his growth.

He saw the light in Toyota’s approach to its supplier (Ikeda and Nakagawa 2002) – the Toyota business was marginal, the plant was just starting up, but the method intrigued the CEO. He set himself the target to achieve Japanese-like levels of quality whilst reducing costs by 20 to 30 percent (Goutard 1994). To do so, he built on five pillars: people involvement, production system, supplier integration, continuous innovation and total quality. Most of these pillars appear in Shah and Ward’s work (Shah and Ward 2007). He persuaded Freddy Ballé to join him from Renault to become Industrial VP and set up the *Valeo Production System* (VPS) as a copycat of the TPS. The rapid improvement in quality and price rebates was possible by cost-reducing strategy while protecting Valeo’s growth through the development of a diversified set of international automotive clients, in particular German manufacturers (F. Ballé 2016). In the next decade, Valeo was to become a key player in the global automotive supplier market.

Valeo's very visible success with lean at the time, led it to be recognized as a complete system (Marodin and Saurin 2013), not simply a collection of tools – a system based on individual autonomy and team involvement (Neirotti 2018). Working closely with Toyota, Valeo engineers were learning lean deeply straight from the source. At some point they became so overwhelmed by all this new knowledge that they shopped around for a way to codify what they were discovering and a consultant suggested they use a “roadmap” template: identify the knowledge topics, and then split them by levels, from beginner (1) to advanced level (5) with all the intermediate steps. These roadmaps were to have a bizarre influence on lean development in France (Mostafa, Dumrak, and Soltan 2013; Hurd 2004).

System experts at Valeo soon realized that the roadmaps were a convenient tool to classify knowledge by breaking topics into subtopics and creating a “path” from ignorant to expert, but that, in real life, few people learned that way (Alves, Dinis-Carvalho, and Sousa 2012). The trajectory of each site depended far more on the – quite random – sequence of “aha!” moments of the site director than any codified language (Sim and Rogers 2009). Freddy Ballé formalized his understanding of a “system” as a set of typical problems/typical solutions. In essence, the VPS team would use a few classic lean tools as a way to offer each management team the same experience, look for aha! (or not) and then build on each person's budding understanding to solve the next typical problem (F. Ballé 2016). Solutions had a generic envelope, but it became very clear early on that the way to top quality as well as cost reduction was from local smarts and specific engineering tricks – which had a lot more to do with the hypothesis testing than applying tools cookie-cutter fashion.

This was not so obvious from the outside. Valeo attracted a lot of attention and most people only saw the systematic implementation of tools, such as flow-and-layout, 5S or TPM. They did not realize that the tool asked the question: “look at this, would you?” yet did not dictate the answer, which largely depended on local plant managers, supervisors and operators

coming together to solve technical problems (Alves, Dinis-Carvalho, and Sousa 2012). The upshot is that in the late nineties, lean implementation in France became largely equated with programs to forcefully acquire-and-follow a roadmap. This interpretation fit well with France's Fayol/Taylor industrial past as a way to deploy the new "lean" best practices. Regardless of their poor track record performance-wise, roadmaps have proven very sticky and new ones are still being produced to this day.

The other unexpected development of the early nineties in France was academic skepticism to the very idea of lean. French experts of automotive industrial experts, Robert Boyer and Michel Freyssenet challenged the rosy-eyed interpretation of Japanese-based methods in industrial circles at the international network of practitioners and researchers on automotive industry (GERPISA) from 1993 to 1997, which they summed up in their influential paper "The World That Changed The Machine" (Boyer and Freyssenet 2001) taking the counterpoint of Womack and Jones' seminal work *The Machine That Changed The World* (J. P. Womack, Jones, and Roos 1990), arguing that Toyota's success was the result of its unique post-war circumstances, much like Honda and VW. They saw in "Toyotism" an extreme form of Taylorism, not an alternative model and successfully convinced the academic community that studying lean could be a dead end (Boyer and Freyssenet 2000). It took the publication in France of Shimizu's work (Shimizu 1999) to show how a new Toyotism aims at harmonizing productive efficiency, humanization of work, launch of innovative vehicles and internationalization.

As a result, by the end of the 90's, little of the notion of "kaizen spirit" was left in the French approach to lean. Lean had been absorbed by many large industrial actors into a set of "best practices" to be deployed across sites, with little or no reference to Toyota's original intent

in getting people to think deeply about what they did and come up with insights and initiatives – Taiichi Ohno’s “logic escape¹” (Toyota Handbook).

Take Two: Diffusion

In the early 1980s, car manufacturers had already begun their lean adoption process. At the end of the 1990s, most of automotive suppliers became interested in Lean “systems” and even built their own production systems (Netland 2012; Netland and Ferdows 2014), such as the aforementioned Valeo Production System (VPS, or SPV in French), the Faurecia Excellence System (FES) and the Michelin Manufacturing Way (MMW), and so on. This can be explained partially by the recommendations made by car manufacturers to their suppliers with the support of French public or semi-public institutions such as the French Association for Quality and Performance (AFQP also called France Qualité), the Ministry for Industry and the Movement of the Enterprises of France (MEDEF) through incentive campaigns (for example, the creation of awards such as a national prize of Quality and Operational Excellence).

As would be expected in a country where government takes a very hands-on approach to managing the economy, often intervening at company levels, and devotes significant efforts and budget to its “industrial policy”, the diffusion of lean in France at the turn of the century was partly a public effort. The General Directorate of Industrial Strategies (DGSI), a government unit created to advise French companies from 1991 to 1998, was keen early on to introduce all sort of new operation practices, including lean, to small and medium-sized companies. Several of its regional branches, the Regional Directorates for Industry, Research and the Environment (DRIRE) put together “continuous improvement collective efforts”, joining up with practitioners and local academics, and gathering funds from central government

¹ Logic escape means recognizing the trade-off between constraints and experimenting until we find a creative way to move this trade off. For instance, there is an unavoidable trade-off between the cost of carrying large inventories and the cost of dedicating time to batch changes, which can be broken by repetitive tool change-over kaizen (often called SMED).

as well as from European level. Worth noting is the “action collective lean PME” of the years 1997-99, led from Lyon in partnership with an European community initiative called ADAPT (aimed to assist the workforce adapting to industrial transformation) funded by an European social fund and executed by Ceforalp, a performance consulting association created by the Movement of the Enterprises of France (MEDEF) in 1972. Sixty-six industrial companies experimented a consulting-based version of lean (Baglin and Capraro 1999) A second wave of experiments in small-scale service companies was launched, both in the Rhône-Alpes region (51 companies) and in Berlin (10 companies), due to the European nature of the funds (Baglin and Capraro 1999). The publications of methodological synthesis by academic leaders of the group led to spin-offs of this public efforts in several regions in France. The “lean” labeled was then loosely applied to a wide range of improvement tools, which explains both why so many companies in France, even smallish, has had some kind of experience with “lean”, and why what they know of “lean” often bears little resemblance to actual TPS practices. It is ironic to note that as early as 1938, Kiichiro Toyoda, the founder of the Toyota Motor Company and inventor of just-in-time, refused financial aid from government on the basis that it would impede the newborn company’s efforts towards cost reduction (Toyota company history) – precisely what largely happened with the French government-sponsored “lean” efforts.

In a difficult economic context, lean drew the attention of several companies with its lure of fast productivity gains in various industries: food (Danone), aeronautics (Airbus, Thales), semiconductors (STMicroelectronics), railways (Alstom), chemicals (Rhodia), metallurgy (Alcan), pharmaceuticals (Astrazeneca), cosmetics (L'Oréal), luxury (LVMH), construction (Bouygues), financial companies (AXA, BNP, Société Générale), public services (La Poste) and even hospital. But the experience these corporate organizations had with “lean” was, through some form or other, mostly attempting to set up roadmap-based “excellence systems”. The influential consultancy McKinsey & Co produced a report presenting lean as a full business

system in 2002 (Mc Kinsey Global Institute 2002), which attracted significant interest in French management circles. At the same moment, the authors created an academic platform based in the engineering school *Telecom Paris* to try and share experiences in lean across companies and across the industrial sector, with a first conference held in March 2004. The aim of this conference cycle, still continuing today, was to gather and show the large spectrum of lean experiments conducted in various companies, with different perspectives (130 presentations have been given since the beginning of the cycle). A further aim of this project was to support translating the key lean texts into French, and the lean bookshelf in France rapidly with a new French edition of Jones & Womack *Lean Thinking*, the translation of their subsequent book (J. Womack and Jones 2009), and of Jeff Liker's *Toyota Way* series (Liker, Ballé, and Beauvallet 2008; Liker et al. 2008).

These regular conferences revealed three different kinds of “lean” coexisting in France. The dominant form was “automotive lean” – operational excellence systems, essentially based on deploying performance indicators across a group and tool-based workshops to accelerate improvement, with, or without just-in-time (which made all the difference to global results). The second frequent form was consultancy-driven cost-cutting programs (or short-term missions) based on lean audits, revealing performance gaps, conducting workshops to brainstorm improvement ideas, getting senior management sponsorship for which ideas to pursue with Return on Investment in mind, and then rolling out the program to accumulate “savings”. Finally, a new generation of pioneer CEOs became curious about the origins of lean and the “magic sauce” behind Toyota's enduring, profitable success.

Toyota had far from left the French scene. The French Republic recognized in 1998 the contribution of Toyota's production system regarding the improvement of industrial settings around the world and in particular in France by rewarding Shoichiro Toyoda, then President of Toyota, with the Legion of Honor, French highest decoration. This follows the establishment

of the Toyota Europe Design Development Center in France at Sophia Antipolis in 1996. Then, in 1999, it had opened a transplant factory in Onnaing, in Northern France, producing its first car in 2001. In 2002, it had also started a joint venture with the French automaker PSA to produce cars in Kolin in the Czech Republic. This proximity has renewed PSA's interest in lean, and the unusual realization that lean thinking didn't just apply to manufacturing, but to manufacturing engineering, product development (Soulié 2007) and support functions as well (Ughetto 2015) – the discovery of just how differently Toyota worked at the product development stage came as quite a shock to French engineers – leading to PSA's own PSA Excellence System (Magnani 2016). This closeness to Toyota helped PSA get a deeper understanding of the whole system through a long immersion of its engineers and managers at Toyota Peugeot Citroën Automobile (TPCA), the joint-venture factory.

Take Three: Differentiation

The visible success of these Toyota ventures continued to attract attention. Journalists were confused at the enduring mystery of Toyota's ways of doing business on the one side and the increasing variety of so-called "lean" programs and approaches, on the other. This led to the founding in 2007 of the *Institut Lean France*, as part of the Lean Global Network, as research and knowledge sharing center on lean practice. The institute became a gathering place for CEOs and industrial leaders wanting to understand Toyota-style lean more deeply in order to lead their own transformations in their own companies. In 2009, a systematic review of 163 French organizations was undertaken to better understand the expansion of Lean in France: the findings were that more and more French companies were moving towards lean management, but with varying degrees of maturity (Beauvallet and Houy 2010b). As systems prescribed actions and indicators, managers often aimed for visible or easily-grasped components of the system, but not for the more demanding practices that led to Toyota's success: companies reduced inventories rather than improve logistics and reduce batch size, companies tightened quality

controls through increased inspection but without basing it on greater abnormality detection and responsiveness, companies practiced continuous improvement but struggled to standardize their learning or work processes.

Thanks to *Institut Lean France*, lean continues to spread in France through a structured network. Since 2009, a public policy named “Quality and Performance 2010” has been promoting and financially supporting the implementation of the productivist lean approach, renamed “Operational Excellence”, to promote the competitiveness of French companies – an initiative of the Ministry of the Economy, Finance and Industry, which considered insufficient the dissemination of operational excellence techniques within the French organizations. Indeed, following reports published by consulting firms – the McKinsey & Company’s Report: “*Giving a new impetus to industry in France*” (Mc Kinsey Global Institute 2006) as well as Algoé’s study “*Operational Management and Lean*” (Algoé Consultants 2008) fostered government interests in lean. Then, the “Quality and Performance 2010” policy was encouraged by numerous support programs undertaken by local branches of the ministry (*Regional Directorates for Enterprises, Competition Policy, Consumer Affairs, Labour and Employment* – DIRECCTE²), regional councils, professional groups and consular corps in particular. More than 1500 companies benefited from it between 2009 and 2012. In order to reach as many companies as possible, regional mediators are created. They offered assistance while encouraging professionals to start their lean journey. The purpose of these initiatives was to stimulate the economy at a national and regional level. The French State also undertook to apply lean to itself. Under President Nicolas Sarkozy, the newly created *State Modernization Agency* (DGME) started an internal lean consultancy within the public sector, as part of the New Public

² DIRECCTE are the resulting organizations of the merger, which occurred in 2010, of former DRIRE, local branches of the ministry for industry, and local branches of the ministry of labor. The merger largely defocused their efforts from promoting industrial evolutions to controlling labor conditions. In 2019, this evolution stepped up, with two thirds of the DIRECCTE teams reporting to the ministry of economy and finance (which has progressively taken over the ministry for industry at the beginning of the 21st century) made redundant.

Management inspired *General Public Policy Review* (RGPP). The program and people embodying it from the start within the Agency survived its various structural reorganizations, from DGME to *General Secretariat for the Modernizing of Public Action* (SGMAP), then from SGMAP to *Inter-Ministerial Delegation for Public Transformation* (DITP), attracting sufficient attention from public sector unions and journalists to be heavily criticized (Chemla-Lafay 2011), but not enough traction to play any significant role in the evolution of the French public sector, though some local workshops produced the usual positive results.

In addition, many resources around lean are produced and made available to companies by other organizations, associations or social networks. These include the French National Organization for Standardization (AFNOR), which promotes a “Responsible Lean” approach, the Association for Manufacturing Excellence (AME) and the Information Technology Club of Large French Corporations (CIGREF), etc. In particular, the changes made to the ISO 9001:2015 standard have made it possible to integrate lean as a management system and therefore to promote its dissemination even more in French companies: at the end of 2015, more than 20,000 organizations held this certificate of fine quality management (International Organization for Standardization 2018). In addition to these resources and programs, several consulting firms offer their services to help adopting lean, which contributed to its massive spreading and diversity: many companies chose to engage in lean adoption to fulfill their specific needs (cost reduction, improvement of quality levels, reduction of deadlines, short-term profitability, etc.) and cherry-pick the tools that interest them, forgetting the system as a whole.

When the “Quality and Performance 2010” plan was being implemented, the Ministry of Industry had planned to encourage the opening of learning factories based on the German

example³, largely influenced by global consultancies McKinsey and BCG that were pushing similar schemes across Europe. The first such factory, called “INEXO” (Institute of Operational Excellence), aimed to improve companies’ performance by training professionals and students to get a deeper understanding on lean through a learning-by-doing perspective. This learning factory was created by several schools including Ecole Catholique d’Arts et Métiers de Lyon (ECAM), Ecole Centrale Lyon, Arts et Métiers and Ecole des Mines de Saint-Etienne with assistance of McKinsey & Company. Other learning factories were built in France as a result of these incentives, the emergence of which is the result of several factors: for example, DynEO (Dynamics of Operational Excellence), in the south of France, was created by regional companies including STMicroelectronics and Airbus Helicopters in partnership with two engineering schools: Arts et Métiers and Ecole Centrale Marseille.

At the same time, the Ministry of Industry in partnership with the national committee of Quality and Performance ordered a study performed by Alain Dorison, who was then Dean of the industrial engineering school Ecole des Mines d’Alès after having been one of the leaders of the “operational excellence” plan at the Regional Directorates for Industry, Research and the Environment (DRIRE) level, to highlight the state of lean teaching in France (Dorison 2009). The consequence of the study was to reinforce the quality of training and increase the number of engineering and business students trained on lean by encouraging all engineering and business schools to design a lean curriculum. Following this report and the plan's incentives, additional training courses then emerged throughout France: for instance, since September 2009, the founding members of the Lean Enterprise Project have designed a certification course on Lean Management: The Certificate of Specialized Studies in Lean Management (CES Lean Management), delivered by Télécom Paris, is at the core of a larger community of about 150

³ The first german learning factory was created in 2007 by the Center for Industrial Productivity and McKinsey & Company at the Technical University of Darmstadt.

alumni and 2000 subscribers to the Télécom Paris lean newsfeed. Other advanced Masters are also promoted at Ecole Catholique d'Arts et Métiers de Lyon (ECAM), CentraleSupélec, Arts et Métiers ParisTech, Université Paris-Dauphine, Campus d'enseignement supérieur et de formation professionnelle (CESI), Institut Supérieur de Mécanique (SupMéca)... Lean has also entered the curricula of the main master degrees of famed French engineering and business schools, such as Ecole des Mines or ESSEC Business School (Ecole supérieure des sciences économiques et commerciales). Nevertheless, it is usually presented quite superficially as one of several recent trends in management practices, and seldom described as a one-of-a-kind paradigm. Many French engineering and management students are introduced to lean thinking, which, perversely seems to mostly reinforces the *blasé* attitude of many French managers towards it.

In 2012, Eric Ries published *The Lean Startup* (Ries 2012), which was translated into French in 2015. This led many agile supporters to dig deeper into lean thinking and move on beyond agile interpretations of lean tools such as Kanban or autonomous teams. At the same time, autonomous teams were taken to the extreme by proponents of a “liberated company”, autonomy-based companies, by contrast with command-and-control companies (Getz and Carney 2016) or holacracy, a decentralized management in which authority and decision-making are distributed throughout a holarchy of autonomous teams, which took French management by storm for a couple of years before petering out quietly for lack of visible generalizations. But the relationship between lean and liberated enterprise seems to be blurry.

Lean in France is subject to several criticisms, in particular about the working conditions of employees (Ughetto 2009; Pardi 2013; Lorino 2014). These criticisms helped start a discussion among academics and practitioners about the possible employees' outcomes of lean adoption. Many organizations such as the French National Research and Safety Institute for the Prevention of Occupational Accidents and Diseases (INRS), the National Pension Fund for

Retirement and Occupational Hazards (CARSAT) and France's National Agency for Improved Working Conditions (ANACT-ARACT) ran detailed studies on the links between the adoption of lean and the impact on employees. In particular, the INRS study conducted in partnership with CARSAT (2013) on the links between lean and safety at work made it possible to identify the precautions to take when adopting lean: it helped spread the human dimension inherent to lean (Magnani, Carbone, and Moatti 2019; Beauvallet and Houy 2010a).

At the origins of lean thinking, Taiichi Ohno focused on *muri* – overburden - (especially physical and mental overload) as the principal cause of organizational problems. Rather than intensifying the use of people, he advises keeping an “organizational slack” (Lorino 2014) to create the capacity of coping with hazards and demand variations when necessary, avoiding problems congestion. As a result, the reduction of *muri* consists in creating an additional availability that will be activated to improve the system, by solving field problems or challenging the status quo. As many experts in complex systems note, when the average rate of capacity utilization exceeds 80 percent, it becomes more probable that the smallest unexpected event leads to chaotic system behaviors and the collapse of capacity.

Nowadays, Lean and TPS continue to generate research (Tsukada and Ibusuki 2018; Dorigatti and Rinaldini 2019; Krzywdzinski, Butollo, and Jürgens 2018). The « *Groupe d'Etude et de Recherche Permanent sur l'Industrie et les Salariés de l'Automobile* » (GERPISA), known as the international network of automotive studies, approaches lean with a contemporary perspective regarding the role of employees, its role within the production system and depicts lean as an organizational method adapted to current developments (Ughetto 2015; Dorigatti and Rinaldini 2019) engendered by the digitization of industrial processes.

In particular, several links have been established between lean and digitization (Rosin et al. 2019; The Boston Consulting Group 2018), which has led to the birth of the “*La Nouvelle France Industrielle*” (The New Industrial France) program, launched in 2013. A report was

published to show how technology, production organization and corporate culture are advancing together in the future transformations to be carried out in companies (Pellerin and Cahier 2019). Lean serves as a structuring support but insufficient when the human dimension of the transformation is overlooked (The Boston Consulting Group 2018; Magnani, Carbone, and Moatti 2019). Productivity gains are difficult to sustain when employees feel disengaged, and the new constraints induced by the transformation rarely go down well with the staff. Then, wide dissemination of these new organizational models encourages us to reconsider the criticisms addressed to them and the benefits that can be expected from it. “Lean” programs reverted to the mean of various other methods (Six Sigma, Theory Of Constraints, Agile, etc.) in a context where the general managers hope to achieve significant productivity gains and are therefore looking for methods promising the discovery and exploitation of massive productivity opportunities (Ughetto 2015). But the sustainability principle and protection of what is in place against other initiatives – Digitization, Liberated company, Agility – is still to be discovered.

Analysis

With one thing and another, lean has now touched the vast majority of industrial firms in France and spread out of industry to sectors as widespread as healthcare or digital companies. Nevertheless, not all these lean forms are of fundamentally different nature. Much of the tension in the debate about lean in France stems precisely from the plasticity of practices undertaken under the lean label. Even among apparently successful lean efforts, the durability of success and capacity to control negative external effects on labor relations vary (Bertrand and Stimec 2011). The three dominant forms of lean, excellence system, performance program or CEO transformation continue to co-exist, reflecting widely divergent worldviews:

- *Traditionalist*: French industrial companies are traditionally run along functional lines, hierarchical independence, budget control and large, staff-based transverse modernization projects – whether managerial or technical. Lean through this

perspective is seen as an essential managerial innovation which needs to be rolled out across the company through performance indicators and tool-based workshops, often with a kaizen imperative built into middle-management objectives and performance appraisals.

- *Taylorist*: without any transformational ambition, consultant-led optimization programs with cost reduction objectives broken down in gap assessment and corrective actions. Whether internally led with a “lean office” or externally supported by consultants, these programs roll-out tools to monitor performance and then solve gaps through the use of lean problem-solving tools to generate short-term improvements and “savings.”
- *Toyotist*: the adoption of the Toyota Way by the senior leadership who sets themselves the task of truly learning the TPS as a *learning* system of “product development through people development”. At the workplace, this is reflected in conducting gemba walks and building the system from the bottom up through mutual trust: customers first, respect for employees, teamwork between functions with the aim of creating a leaner organization, more focused on customer satisfaction, meaning in work and agility in response, and overall with greater value – more benefits to the market at less overall costs.

The traditionalist approach to lean come right out of France’s long tradition of modernization and catch-up. Lean, in this case, is seen as a new technology that needs to be acquired in order to improve operations – for instance, in the current period, many such companies are switching from lean to 4.0 as their modernizing drive (Sanders et al. 2017). Typically, the senior management will acquire lean capability through purchasing an “excellence system” (Netland 2012) or having one developed in-house, based on what is known of the TPS and what is acceptable without challenging the strategy, organization or culture of the company. This “excellence system” is likely to be expressed as a roadmap of various practices to be installed,

with a small team dedicated to its implementation. These are transformational programs and so every business unit is expected to adopt 1/ a set of “lean” indicators and 2/ deploy the standard lean tools wall-to-wall. The upside of this approach is that, indeed, the best managers use it to learn and to leverage their performance. The downside is that it often becomes a bureaucracy that generates endless “one more thing” to implement. It appears also a bit tricky to consider roadmaps that are mostly top-down, when in comparison lean at its origins was mostly bottom-up.

This approach to lean largely centers on standards (as the roadmap generates a huge amount of new standards to put in place) and systematic audits (Crabill et al. 2000; Bozdogan et al. 2000). When led by senior leaders experienced in lean, these programs can generate spectacular short-term results as the leader focuses efforts on strategic issues such as safety, quality or delivery. But in many cases, compliance takes over competence and, not surprisingly, middle managers worry more about how they’re graded during the audit than how to improve performance. The central assumptions of this approach are that (1) a more rigorous application of standards will lead to performance improvement and that (2) more managerial attention and top leadership engagement in the application of standards will encourage people to learn through the application of standards.

If we look back to the nineties, it is undeniable that this modernizing approach has indeed changed the face of many French operations, mostly on clearing up the workspace and better organizing materials flow, which has brought significant improvement. However, beyond gathering low-hanging fruits, this approach has by and large failed to change how the company operates, both in terms of logistics (Enterprise Resource Planning software continue to drive scheduling and few just-in-time pull systems are in place) (Jones, Hines, and Rich 1997) and product development (Tortorella et al. 2015), which remains largely untouched by most lean experts. Broadly, there have been visible efficiency improvements from adopting excellence

systems, mainly by straightening out areas that were in complete disarray, but very little significant quality and cost-base advances in terms of global competitiveness. Valeo's success of improving visibly quality whilst reducing total costs by 20 to 30% from using an excellence system has rarely been replicated. The wide difference with Toyota's form of lean can be seen by the Toyota-trained executives that have been poached by well-established French industrial companies to support these excellence systems and then become frustrated and disillusioned at the very restricted role they are asked to fulfill.

The Taylorist approach to lean is also still frequent, mostly driven by premium consulting firms. This outlook has no fundamental change ambition – it considers that the firm is as it is, in terms of strategy, organization and culture, but discrete points of non-performance holds results back. This is the continuation of the “point kaizen” early approaches to lean, reducing lean to “waste elimination” (Pettersen 2009). A diagnostic is established by Value Stream Mapping (Hines et al. 1998) or lean management performance assessments (Shah and Ward 2007), and opportunities to use classic lean tools are identified as specific performance gaps to be resolved. Potential gains are stacked up showing how results could improve if all the gaps are closed. This generates project “charters” supported by senior management sponsors about how to close these performance gaps by solving the underlying problems and generate results.

Lean programs remain popular with many top executives and, indeed, they dynamize the company. Unfortunately, the effects are usually short-lived and within two years, resistance sets in as local problems are solved from sheer energy but the faulty procedures that caused the problem in the first place are not addressed. Reversal to the norm sets in and the people who got drawn into the improvement program burnout, lose their motivation and learn to become cynical when it comes to top-down improvement programs. Over the past decades such programs, and their inevitable failure after initial extractive results have contributed to creating

a negative image of lean in France's popular media, always ready to stigmatize business leaders for being both callous and incompetent – solely driven by financial results and profits.

The third lean approach is rarer but also more of a French specificity. In 2002, Jacques Chaize, then CEO of an industrial valve manufacturer started a lean “boost” program with a top consultancy sponsored by the parent company in Denmark. After following the familiar curve of initial enthusiasm, quick wins, disappointment on hard issues, resistance and then downright hostility to the program, Chaize decided to interest himself more deeply into the origins of lean and its true nature, at the time of the 2008 crisis. He joined Jean-Baptiste Bouthillon, newly appointed CEO of a family-owned construction company and Jean-Claude Bihl, CEO and founder of a high-tech metallurgy company struggling with the disappearance of half his staff due to both the financial crisis and the emergence of the iPhone on his market. Together they explored what lean meant from an executive perspective. With the support of Dan Jones, co-founder of the lean movement, and Orest Fiume, cofounder of the lean accounting movement and ex-CFO of the famous lean case Wiremold, these CEOs explored the “Art Byrne” (Byrne 2012) way of lean, that is to say working with a *sensei* and using the lean tools to change the culture rather than the processes of their firms. An interesting development of this third approach is the recent structuration of “*sensei* lines” in France, many of which go back to Freddy Ballé, or other 1980's automotive old-timers. Four out of six of the authors of *The Lean Sensei* (Ballé *et alii*, 2019) are French, exemplifying the need of explicitly defining roles in a French approach to transformation of pretty much anything.

Lean adoption in France cannot be completely free of cultural factors (Bortolotti, Boscari, and Danese 2015). As in many countries, the strong relationship between Lean and its Japanese origin was questioned to see if it was possible to free oneself from it. The issue has been resolved as Toyota has successfully established its international operations while maintaining the same system, particularly in the United States. What strikes in France, and

probably more broadly for a "Latin Lean", is the inability, linked to a deep aversion, to copying. Copying to understand is not possible; the only acceptable ambition is to be inspired to do better. Thus, to be adopted, lean should be understood, decontextualized in order to be contextualized into the environment of companies which seek its adoption. The Toyota Production System is in fact a system (the S of TPS) much more complex than a sum of tools and French understanding has often passed through the American prism, necessarily distorting, like any prism, with as an example the loss of meaning that is found in the translation of "Toyota Production System" into just "Lean". Low signal-to-noise ratio in conceptualization led to loss of the rationale behind practices or tools, which in French context was particularly detrimental to continuous efforts in lean.

On the other hand, the French mindset is eager for conceptualization, and it goes beyond simple description into generalized complete and scalable solutions. This makes France prone to management fads as well as doing its best to adapt the fad to local conditions and dispel the challenging aspects: "*plus ça change, plus c'est la même chose*" ("every change ends up defending the status quo"). It is the authors' view that, since the early 80's, lean has been present in France but rarely taking center stage. Automotive lean pioneers operated in an adversarial culture with a highly organized workforce, and this led to an early disapproval of lean by unions, left-winged politicians and intellectuals, and journalists. Companies "doing lean" adjusted accordingly and did not publicize it. Hence lean has been coming and going, rearing up each time another management fad ended the circle of high expectations, widening adoption, disappointing results and practical disappearing (in the course of their careers, the authors witnessed such rise and fall of "reengineering", "Six Sigma", first "digital economy" before the 2001 crisis and, more recently, "design thinking" and "agile"). The fact that lean Toyotist practitioners in France resisted the "belt" movement, of consultant-led certification of almost-

beginners in any management discipline as “green” to “black” belt, also explains why lean cannot be seen everywhere in LinkedIn resumes of French engineers or middle-managers.

Still, this very French impulse to conceptualization also led to efforts to produce unifying synthesis, especially of all the works that explain lean but that speak of the same thing while being all different, like for example Agile or Six Sigma. This is what some of the latest books published (M. Ballé et al. 2017; Gaudichau, Matsumoto, and Magnani 2019; Netland and Powell 2016) attempt, in a spirit of continuous improvement. We could very well be witnessing in France the actual spill-over of deeper lean principles and technique, beyond the fog-of-war confusion of journalistic debates and trend-chasing programs in larger companies.

This unique path of transforming the company by transforming the leadership’s outlook has taken hold and garnered interest from more CEOs across industries and regions in France, from hospital management to high-tech equipment for automotive, aerospace or pharmaceutical industries. Lately, pure-play digital CEOs have joined the movement, exploring the new territory of what lean means for software and service-based businesses as opposed to traditional industrial operations. The specific aspects of these experiments are (1) a focus on the continuity of customer satisfaction (as opposed to organizational changes), (2) the construction of pull systems (to reveal real-life flow blockages) and (3) people development through problem-based learning and teamwork to create a fit organizational culture.

Conclusion

In France, a wide array of industrial companies have made attempts to adopt lean, the majority of these being in the automotive sector (Beauvallet and Houy 2010b). Automotive companies, such as Renault and Groupe PSA, and their suppliers, opened the way to lean for other companies. A global interest in Toyota and its factories in Japan, the United States, and Europe gave consultancy companies and researchers a way to help transfer and spread lean in France. Various waves of government policies encouraged companies and institutions to adopt

Lean but oftentimes diverged from its original approach, and indeed, intent. These lean adoption initiatives in France can be distinguished into three phases: The Emergence of Lean, its Diffusion and its Differentiation.

Curious professionals, resilient researchers, Toyota sensei, diligent consultants, politicians, association creators... were all the actors that took part in the adoption of lean in France. But there is still a long way to go. We identified three dominant forms of lean that continue to co-exist, all the while reflecting widely divergent worldviews: Traditionalist, Taylorist, and Toyotist. These dominant forms of lean lead to different outcomes in organizations, and often to disappointing or short-lived results. The explanation comes from the Toyotist approach: the most important challenge companies face during adoption is the understanding of the dual integration of the human and technical systems on which lean is based (Marodin and Saurin 2013).

These findings are crucial with regard to the Lean renaissance happening in France, as they serve as a foundation for new managerial innovations such as the “liberated company” and “digitization”. This chapter is aligned with the authors’ perspective that the way lean methods are adopted – the environment in which they are used and the competencies of the people who use them – have an impact on the long-term outcomes of the adoption process (Beauvallet and Houy 2010a). Lean remains a dynamic learning system that structures and continuously stimulates employees’ activities, targeting customer satisfaction through flow improvement and people development. Moreover, by moving away from static understanding, some French players have favored a field-based, experimental, and therefore more vital approach. To this end, the system provides employees with the tools they need to foster and leverage organizational learning by giving them the opportunity to explore and challenge the status quo. Lean systems make problems visible but, to perform as hoped, they require employees to

actually own and solve these problems, and management to support them in doing so (M. Ballé et al. 2017).

References

- Algoé Consultants. 2008. “Etude Management Opérationnel et Lean.”
- Alves, Anabela C., José Dinis-Carvalho, and Rui M. Sousa. 2012. “Lean Production as Promoter of Thinkers to Achieve Companies’ Agility.” *Learning Organization* 19 (3): 219–37. <https://doi.org/10.1108/09696471211219930>.
- Baglin, and Capraro. 1999. *L’entreprise Lean : production*. Lyon: Presses Universitaires de Lyon.
- Ballé, Freddy. 2016. “1976 -2016 : quarante années de recherche de la voie Lean.” Conference presented at the 25ième séance du Séminaire Lean en France, Télécom Paris, June 24. http://www.lean.enst.fr/wiki/pub/Lean/LesPresentations/F_Ball_-_La_Voie_du_Lean.pdf.
- Ballé, Michael, Godefroy Beauvallet, Art Smalley, and Durward K. Sobek. 2006. “The Thinking Production System.” *Reflections* 7 (2): 1–12.
- Ballé, Michael, Daniel Jones, Jacques Chaize, Orest Fiume, and Tom Ehrenfeld. 2017. *The Lean Strategy: Using Lean to Create Competitive Advantage, Unleash Innovation, and Deliver Sustainable Growth*. New York: McGraw Hill Higher Education.
- Beauvallet, Godefroy, and Thomas Houy. 2010a. “Research on HRM and Lean Management: A Literature Survey.” *International Journal of Human Resources Development & Management* 10 (1): 14–33.
- . 2010b. “L’adoption des pratiques de gestion lean.” *Revue française de gestion*, no. 197 (January): 83–106.
- Belekoukias, Ioannis, Jose Arturo Garza-Reyes, and Vikas Kumar. 2014. “The Impact of Lean Methods and Tools on the Operational Performance of Manufacturing Organisations.” *International Journal of Production Research* 52 (18): 5346–66. <https://doi.org/10.1080/00207543.2014.903348>.
- Bertrand, Thierry, and Arnaud Stimec. 2011. “Santé au travail.” *Revue française de gestion* n° 214 (5): 127–44.
- Bortolotti, Thomas, Stefania Boscari, and Pamela Danese. 2015. “Successful Lean Implementation: Organizational Culture and Soft Lean Practices.” *International Journal of Production Economics* 160 (February): 182–201. <https://doi.org/10.1016/j.ijpe.2014.10.013>.
- Bounine, Jean, and Kiyoshi Suzuki. 1986. *Produire Juste à Temps - Les Sources de La Productivité Industrielle Japonaise - Préface de François Dalle*. 2nd edition. Paris: Masson et Cie.
- Boyer, Robert, and Michel Freyssenet. 2000. *Les Modèles productifs*. Paris: La Découverte.
- . 2001. “The World That Changed the Machine - Synthesis of GERPISA Research Programs 1993-1999.” *Actes Du GERPISA* 31: 7–71.
- Bozdogan, Kirk, Ronald Milauskas, Joe Mize, Deborah Nightingale, Abhinav Taneja, and David Tonaszuck. 2000. *Transitioning to a Lean Enterprise: A Guide for Leaders, Volume III, Roadmap Explorations*. Vol. 3. Cambridge, Massachusetts: M.I.T. <http://dspace.mit.edu/handle/1721.1/81894>.
- Byrne, Art. 2012. *The Lean Turnaround: How Business Leaders Use Lean Principles to Create Value and Transform Their Company*. New York: McGraw-Hill Education.

- Chabiron, Catherine. 2018. "An Interview with Lean Thinking Pioneer Freddy Ballé." *Planet Lean* (blog). May 21, 2018. <https://planet-lean.com/freddy-balle-lean-management-toyota/>.
- Chemla-Lafay, Annie. 2011. "La Lean Administration : Un Choix Managérial Dangereux." *Cadres-CFDT* 445–446 (September): 43–51.
- Coriat, Benjamin. 1991. *Penser à l'envers : Travail et organisation dans l'entreprise japonaise*. Nouv. éd. Paris: Christian Bourgois Editeur.
- Crabill, John, Ed Harmon, Don Meadows, Ron Milauskas, Craig Miller, Deborah Nightingale, Brian Schwartz, Tom Shields, and Bob Torrani. 2000. *Production Operations Level Transition to Lean Roadmap: Production Operations Transition-To-Lean Team*. Cambridge: Massachusetts Institute of Technology.
- Dorigatti, Lisa, and Matteo Rinaldini. 2019. "World Class Involvement: Workers' Participation in a 4.0 Lean Production System." presented at the GERPISA Colloquium, Paris.
- Dorison, Alain. 2009. "Rapport Sur l'enseignement de l'excellence Opérationnelle Dans Les Grandes Écoles d'ingénieurs et de Management." <https://archives.entreprises.gouv.fr/2012/www.industrie.gouv.fr/portail/pratique/qualite/rapport-dorison.pdf>.
- Frerejean, Alain. 2006. *Les Peugeot : Deux siècles d'aventure*. Paris: Flammarion.
- Gaudichau, Olivier, Eduardo Hiroshi Matsumoto, and Florian Magnani. 2019. *540° to Lean: When common sense doesn't work, turn 180° and explore in 360°*. AFNIL.
- Getz, Isaac, and Brian Carney. 2016. *Liberté & cie : Quand la liberté des salariés fait le succès des entreprises*. Paris: Flammarion.
- Goutard, Noël. 1994. "Réussir Par La Fermeté." Séminaire Vie des affaires, L'école de Paris du management. <https://www.ecole.org/fr/seance/8-reussir-par-la-fermete>.
- Haour, Georges. 2004. "The CEO as Innovation Champion." In *Resolving the Innovation Paradox: Enhancing Growth in Technology Companies*, edited by Georges Haour, 15–29. London: Palgrave Macmillan UK. https://doi.org/10.1057/9780230510555_2.
- Hermel, Philippe. 1997. "The New Faces of Total Quality in Europe and the US." *Total Quality Management* 8 (4): 131–43. <https://doi.org/10.1080/0954412979578>.
- Hermel, Philippe, Rick Edgeman, and Jens Dahlgard. 1999. "History and Specifics of the Quality Movement in France." *Quality Engineering* 11 (June): 619–24. <https://doi.org/10.1080/08982119908919282>.
- Hines, Peter, Nick Rich, John Bicheno, David Brunt, David Taylor, Chris Butterworth, and James Sullivan. 1998. "Value Stream Management." *The International Journal of Logistics Management* 9 (1): 25–42. <https://doi.org/10.1108/09574099810805726>.
- Hurd, Annie-Pierre. 2004. "Implementation of Lean Processes at a High-Mix Low-Volume Aerospace Manufacturing Facility in France." Thesis, Massachusetts Institute of Technology. <https://dspace.mit.edu/handle/1721.1/34795>.
- Ikeda, Masayoshi, and Yoichiro Nakagawa. 2002. "Globalization of the Japanese Automobile Industry and Reorganization of Keiretsu-Suppliers." *Actes Du GERPISA* 33: 29–40.
- International Organization for Standardization. 2018. "The ISO Survey of Management System Standard Certifications." International Organization for Standardization. <https://www.iso.org/the-iso-survey.html>.
- Jacot, Jacques-Henri. 1998. *Du fordisme au toyotisme ? / les voies de la modernisation du système automobile en France et au Japon*. Collection Etudes et Recherches n°7-8. Paris: La Documentation Française.
- Jones, Daniel T., Peter Hines, and Nick Rich. 1997. "Lean Logistics." *International Journal of Physical Distribution & Logistics Management* 27 (3/4): 153–73. <https://doi.org/10.1108/09600039710170557>.

- Krzywdzinski, Martin, Florian Butollo, and Ulrich Jürgens. 2018. "The Role of Labor in Lean Production and Industrie 4.0: Continuities and Differences." presented at the GERPISA Colloquium, Paris.
- Liker, Jeffrey, Michael Ballé, and Godefroy Beauvallet. 2008. *Le modèle Toyota*. Paris: PEARSON.
- Liker, Jeffrey, David Meier, Michael Ballé, and Monique Sperry. 2008. *Talent Toyota : Les hommes au coeur de la réussite*. Paris: PEARSON.
- Lorino, Philippe. 2014. "La fuite managériale devant la complexité : l'exemple historique du 'lean management.'" ESSEC Working paper 1410. <https://hal-essec.archives-ouvertes.fr/hal-01023701/document>.
- Loubet, Jean-Louis. 1990. *Automobiles Peugeot : une réussite industrielle, 1945-1974...* Paris: Économica. <http://gallica.bnf.fr/ark:/12148/bpt6k33282765>.
- . 1998. "Citroën et l'innovation (1915-1996)." *Vingtième Siècle. Revue d'histoire* 57 (1): 45–56. <https://doi.org/10.3406/xxs.1998.3709>.
- Magnani, Florian. 2016. "Historical Evolution of a Lean System: Case Study of the PSA Group." *Logistique & Management* 24 (3–4): 199–206. <https://doi.org/10.1080/12507970.2016.1269620>.
- Magnani, Florian, Valentina Carbone, and Valérie Moatti. 2019. "The Human Dimension of Lean: A Literature Review." *Supply Chain Forum: An International Journal* 20 (2): 132–44. <https://doi.org/10.1080/16258312.2019.1570653>.
- Marodin, Giuliano Almeida, and Tarcisio Abreu Saurin. 2013. "Implementing Lean Production Systems: Research Areas and Opportunities for Future Studies." *International Journal of Production Research* 51 (22): 6663–80. <https://doi.org/10.1080/00207543.2013.826831>.
- Mc Kinsey Global Institute. 2002. "Dynamiser La Productivité En France et En Allemagne." McKinsey & Company.
- . 2006. "Donner Un Nouvel Élan à l'industrie En France." McKinsey & Company, revised in 2008.
- Mostafa, Sherif, Jantanee Dumrak, and Hassan Soltan. 2013. "A Framework for Lean Manufacturing Implementation." *Production & Manufacturing Research* 1 (1): 44–64. <https://doi.org/10.1080/21693277.2013.862159>.
- Neirotti, Paolo. 2018. "Work Intensification and Employee Involvement in Lean Production: New Light on a Classic Dilemma." *The International Journal of Human Resource Management*, January, 1–26. <https://doi.org/10.1080/09585192.2018.1424016>.
- Netland, Torbjørn H. 2012. "Managing Strategic Improvement Programs: The XPS Program Management Framework." *Journal of Project, Program & Portfolio Management* 3 (1): 31–44.
- Netland, Torbjørn H., and Kasra Ferdows. 2014. "What to Expect From a Corporate Lean Program." *MIT Sloan Management Review* 55 (4): 83–89.
- Netland, Torbjørn H., and Daryl J. Powell. 2016. *The Routledge Companion to Lean Management*. 1 edition. New York: Routledge.
- Ohno, Taiichi. 1989. *L'esprit Toyota*. Paris, France: Masson.
- Pardi, Tommaso. 2013. "Crise et Rejet de La Greffe Toyota à Valenciennes ?" *Le Journal de l'école de Paris Du Management* 1 (99): 29–36.
- Pellerin, François, and Marie-Laure Cahier. 2019. "Organisation et Compétences Dans l'usine Du Futur Vers Un Design Du Travail ?" Presses des Mines, Paris, pp. 132.
- Pettersen, Jostein. 2009. "Defining Lean Production: Some Conceptual and Practical Issues." *TQM Journal* 21 (2): 127–42. <https://doi.org/10.1108/17542730910938137>.
- Ries, Eric. 2012. *Lean Start-Up*. Paris: Pearson.

- Rosin, Frédéric, Pascal Forget, Samir Lamouri, and Robert Pellerin. 2019. "Impacts of Industry 4.0 Technologies on Lean Principles." *International Journal of Production Research* 0 (0): 1–18. <https://doi.org/10.1080/00207543.2019.1672902>.
- Sanders, Adam, Karthik R. K. Subramanian, Tobias Redlich, and Jens P. Wulfsberg. 2017. "Industry 4.0 and Lean Management – Synergy or Contradiction?" In *Advances in Production Management Systems. The Path to Intelligent, Collaborative and Sustainable Manufacturing*, edited by Hermann Lödding, Ralph Riedel, Klaus-Dieter Thoben, Gregor von Cieminski, and Dimitris Kiritsis, 341–49. IFIP Advances in Information and Communication Technology. Springer International Publishing.
- Shah, Rachna, and Peter T. Ward. 2007. "Defining and Developing Measures of Lean Production." *Journal of Operations Management* 25 (4): 785–805. <https://doi.org/10.1016/j.jom.2007.01.019>.
- Shimizu, Koichi. 1999. *Le Toyotisme. La Découverte*. Paris, France: Repères. <https://www.cairn.info/le-toyotisme--9782707129215.htm>.
- Sim, Khim L., and John W. Rogers. 2009. "Implementing Lean Production Systems: Barriers to Change." *Management Research News* 32 (1): 37–49. <https://doi.org/10.1108/01409170910922014>.
- Soulié, Olivier. 2007. "Que Sais-Je ? Sur Le Développement et La Conception Chez Toyota." Internal document from Groupe PSA.
- The Boston Consulting Group. 2018. "The Most Innovative Companies 2018 : Innovators Go All in on Digital." <https://www.bcg.com/fr-fr/publications/collections/most-innovative-companies-2018.aspx>.
- Tortorella, Guilherme Luz, Giuliano Marodin, Diego Fettermann, and Flavio Fogliatto. 2015. "Relationships between Lean Product Development Enablers and Problems." *International Journal of Production Research* 54 (November): 1–19. <https://doi.org/10.1080/00207543.2015.1106020>.
- Tsukada, Osamu, and Ugo Ibusuki. 2018. "Can the Toyota Production System Be Implemented Abroad? - A Case Study of the Brazilian Automobile Industry." presented at the GERPISA Colloquium, Paris.
- Ughetto, Pascal. 2009. "Une Réorganisation Au Concret: L'implantation Du Lean Manufacturing Comme Travail Managérial." Actes des XIIèmes journées internationales de sociologie du travail, Nancy, France. halshs-00376835.
- . 2015. "Le lean représente-t-il le travail du futur?" *Colloque Quel travail dans l'usine du futur? GERPISA et ENS Cachan, Cachan, France*, March. <https://hal-enpc.archives-ouvertes.fr/hal-01247255>.
- Womack, James, and Daniel Jones. 2009. *Système Lean: Penser l'entreprise au plus juste*. Paris: PEARSON.
- Womack, James P., Daniel T. Jones, and Daniel Roos. 1990. *The Machine That Changed the World: The Story of Lean Production*. Reprint edition (2000). New York: Free Press.