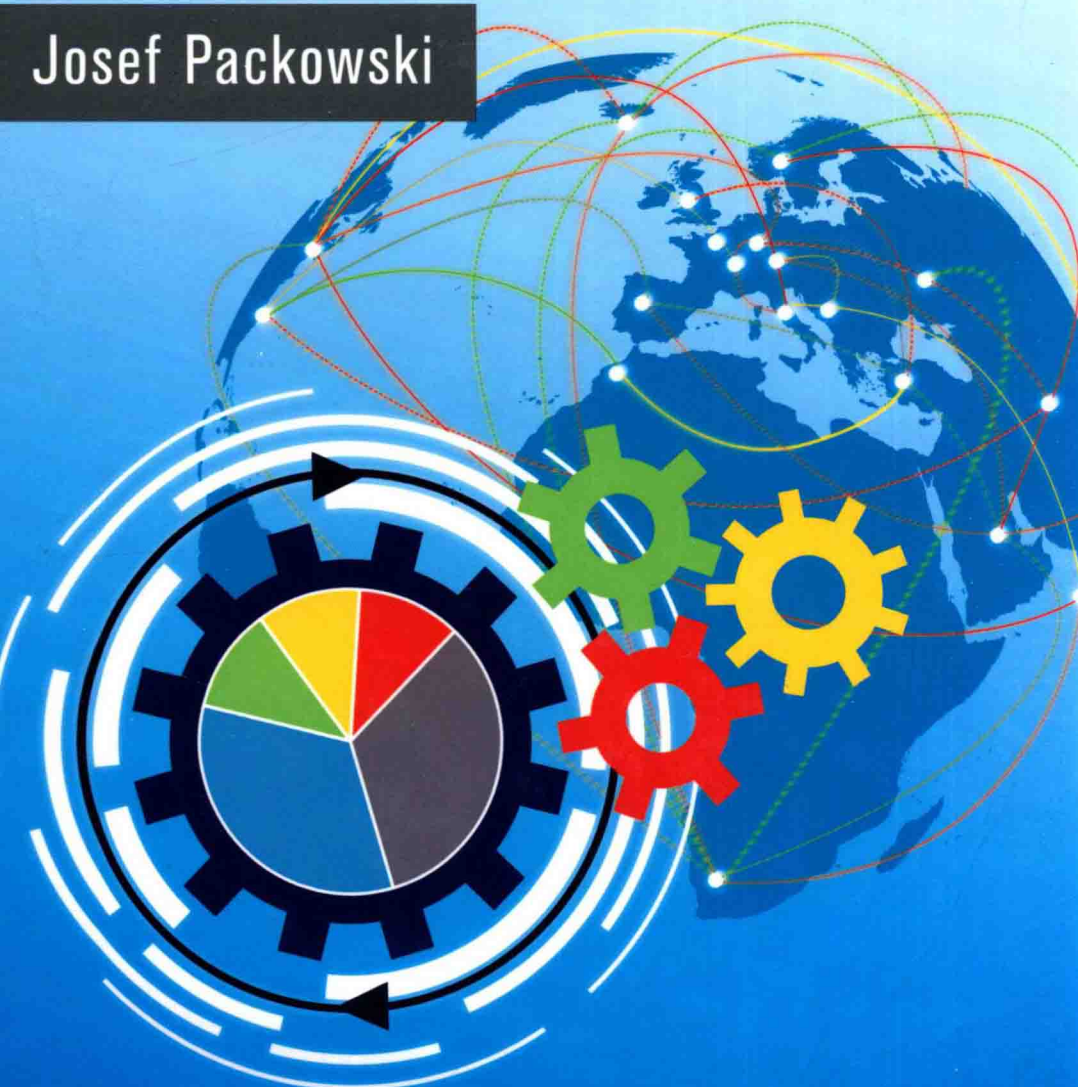


# LEAN Supply Chain Planning

The New Supply Chain Management  
Paradigm for Process Industries to  
Master Today's VUCA World

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A PRODUCTIVITY PRESS BOOK

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*Thanks to all our customers for their  
confidence and ongoing trust in working with us  
as we strive to motivate them and encourage them to adopt  
new ways to solve new challenges in business.*

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# Introduction: What the Book Is All About

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Today, many global supply chains in process industries are neither equipped nor orchestrated to cope effectively with the new VUCA world we are facing. VUCA—volatility, uncertainty, complexity, and ambiguity—is an acronym that originated in the military back in the late 1990s and was quickly adapted to the business environment. It describes precisely the conditions of increasing variability and uncertainty of demand, and the complexity and ambiguity of product portfolios and supply chain networks in which companies operate today.

Facing the threat of increasing VUCA challenges, manufacturers are left grasping for what it means to build a superior supply chain management (SCM) organization that is capable of managing these challenges effectively. Which enablers for agility are required to manage future VUCA dynamics? Those in global network structures (the network footprint) or others in the extended supplier relationship configuration (contract manufacturers, service providers, or suppliers)? Which aspects of today's operational and organizational lean initiatives are delivering tangible cost and efficiency results? How can supply chain organizations sustain reliable supply in an era of ever-widening virtualization of supply networks and increasing exposure to global risk? Finally, where can supply chain managers turn for the answers to these questions?

In response to these challenges, CAMELOT Consulting Group has worked jointly with leading research institutes and key global industry players to come up with a “*New Supply Chain Planning Paradigm*” to face the VUCA challenges in SCM in a new way. The paradigm change in orchestrating supply chains is best explained by laying out a new approach to managing variability, uncertainty, and complexity in today's planning processes and systems.

A few pioneering supply chain organizations in the process industry have already embraced the new way of coordinating and synchronizing their global networks. The reports and industry cases included in this book (see Figure 0.1).



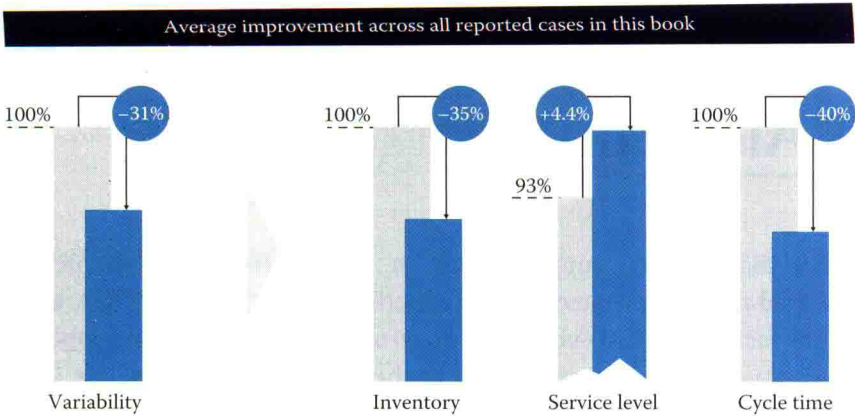


FIGURE 0.1

A step change in variability management improves key supply chain metrics.

Before we move on to present this new supply chain planning approach, we want you to clearly understand the need for a paradigm shift first. In process industries, today's usual supply chain planning practices aim to determine manufacturing decisions up to 12 months prior to delivering actual products to the customers. To do so, planners reach out to their sales and marketing colleagues and ask them for forecasts—preferably as detailed and accurate as possible at the SKU (stock-keeping unit) level. It is obvious that the supply chain performance resulting from such a forecast-based SCM approach is directly linked to the quality of sales forecasts. Therefore, it is understandable that all excellence initiatives in the past have started inevitably by attempting to improve on forecast accuracy, establishing the forecast myth that all activities could be perfectly planned and which still dominates corporate practices. However, ask yourself if we do not all experience difficulty in determining our own personal futures 12 months out, even regarding the subjects we ought to know most about. How then can we expect our sales organizations to know what the future holds for our products in volatile marketplaces at this detailed level of granularity?

So the real issue in SCM is not about improving the accuracy of the sales forecast and reducing the amount of uncertainty in the future, it is rather about *eliminating the need for certainty* in operational planning. We have therefore anchored our LEAN SCM Planning approach in freeing supply chain planners from the need for certainty, ushering in a paradigm change for most planning practices.

A major change that accompanies our *LEAN SCM Planning paradigm* is the management of demand variability. In traditional planning concepts, this is solved in a one-sided way, through planning and scheduling of manufacturing capacities only. This is because in today's supply chain practices, and in the ERP or APS systems that support them, safety stock levels are used as fixed planning parameters and not touched from a planning perspective to buffer variability. This has negative consequences for operational performance and the way in which companies react to demand fluctuations in planning. In this way, the traditional planning approaches represent a conceptual dead-end for today's variability management problems.

Within the new LEAN SCM Planning paradigm, we are *mastering variability with a two-sided approach*. We manage the demand variability in supply chain planning now on both sides, on manufacturing capacities and in inventories. To be more precise, the safety stock elements in all SKU-based inventories are now actively used in planning runs, as they have been designed for, to level replenishment signals and keep market noise out of manufacturing to the extent possible. To make this happen, we have developed a disciplined approach to the *dynamic adaptation of inventory target levels* to changing conditions along the supply chain. This allows SCM to keep a key component of demand variability—demand peaks—out of manufacturing, smoothing capacity utilization, and spending less time resolving production planning and schedule problems. This might sound intuitive, but represents a paradigm shift in the operation of today's planning processes and systems.

The conceptual foundation for managing variability and leveling capacity utilization in local manufacturing sites is the *cyclic scheduling* with “product wheels.” Industry experts such as Ian F. Glenday, Peter L. King, and Raymond C. Floyd have already been able to connect the general lean (manufacturing) concepts, and the underlying elements of simplicity, flow and pull, with physical restrictions that are typical in process industries. These concepts have already been influential in many process manufacturing organizations. We have built on these experiences but needed to go further to apply product wheels in a high-product-mix and high-volatility environment—which we named “*Breathing*” and “*High-Mix*” *Rhythm Wheels*. They are built around optimal product sequences and cycle times. But the most valuable conceptual advancement we have incorporated is our approach to manage variability with two control parameters: the cycle time boundaries. With these new conceptual elements, we are providing



appropriate flexibility in manufacturing to enable companies to manage increasing market volatility, and we also hold the key for smoothing variability and volatility propagation upstream along the supply chain in our hands.

The LEAN SCM Planning concepts we present here have been worked out in light of and for the purpose of *end-to-end supply chain synchronization*. So the central question is how to manage multi-echelon synchronization along supply chains in process industries, with typically long lead times starting, for example, with chemical conversion processes and moving downstream to shorter physical bulk production and packaging processes? In particular, how should supply chain organizations apply cyclic planning at manufacturing sites while aiming for real consumption-based pull replenishment?

In response, we have formalized a “*global takt*” for *synchronization* and achieving end-to-end flow. In a stable supply chain environment, this might seem easy, but not in situations characterized by high demand volatility and high product mixes in manufacturing portfolios. We have to make the Rhythm Wheel approach more flexible, to “breathe” in sync with cycle times, but in a well-structured, disciplined way, within the defined variability control parameters. The key is to “funnel” variability with the Rhythm Wheel cycle time boundaries along the supply chain and in this way actively counteracting the infamous bullwhip effect and achieve a step change in supply chain performance.

With traditional supply chain concepts, the line between planning parameterization (configuration) and the planning run (execution) is blurred. In contrast to this classical planning approach, in LEAN SCM Planning, we have sliced the given planning complexity precisely. We slice the planning task horizontally into global tactical *pre-parameterization* (conditioning) and local planning run areas. Having done so, we have devised a *new LEAN SCM Planning Framework* to better cope with global synchronization needs.

While working with industry pioneers on this new supply chain planning approach, we were confronted almost immediately with additional questions when we stepped into the first implementations:

- How should the organizational model be adapted to the significant change in supply chain planning?
- What are the new roles and responsibilities required in the global supply chain community?

- Which factors should be aligned in corporate performance management to the new planning principles?
- What system gaps can be closed without discarding prior IT (information technology) investments?
- How can this new planning paradigm be implemented to achieve a step change in performance?

To answer these questions, we have consolidated all our conceptual research results and organizational project experience in this book, developed new IT add-on solutions to complement the existing SCM systems for implementation, and given a name to the holistic transformation approach—*LEAN SCM*. This new planning paradigm answers the VUCA challenges in process industries and overcomes the insufficiencies of traditional planning approaches. To highlight the distinction between lean (in small letters)—with its focus on manufacturing objectives—and LEAN—with its focus on end-to-end supply chain synchronization—we coined the all-capitalized term “LEAN” (see Figure 0.2).

Our implementation experience shows that there are three major obstacles to managing a *LEAN SCM transformation* program. First, a company’s executive leadership must understand that this is not a single-project initiative, but rather a journey—in other words, sticking to LEAN SCM once the journey has started is crucial for success. Introducing the new paradigm of integrated supply chain planning and variability management requires a *new SCM operating model* with clear end-to-end accountabilities. This will make end-to-end integration possible between, for example, global inventory and local asset management. It is a new way of coordinating and synchronizing operations and throughput in a multi-step value chain. Top management support, training (and incentives) for all stakeholders, and strong commitment to the paradigm change are the preconditions for successful transformation. But bear in mind that you are aiming for nothing less than a step change in supply chain performance.

Second, aligned *performance management* is a critical success factor in the LEAN SCM transformation. The new conceptual elements and the new planning processes require new process performance indicators, such as Rhythm Wheel cycle time attainment and cycle time variation, to be monitored carefully. Therefore, an effectively adapted and well-designed performance management system is fundamental. But this typically does not imply the need to reinvent current performance management systems.

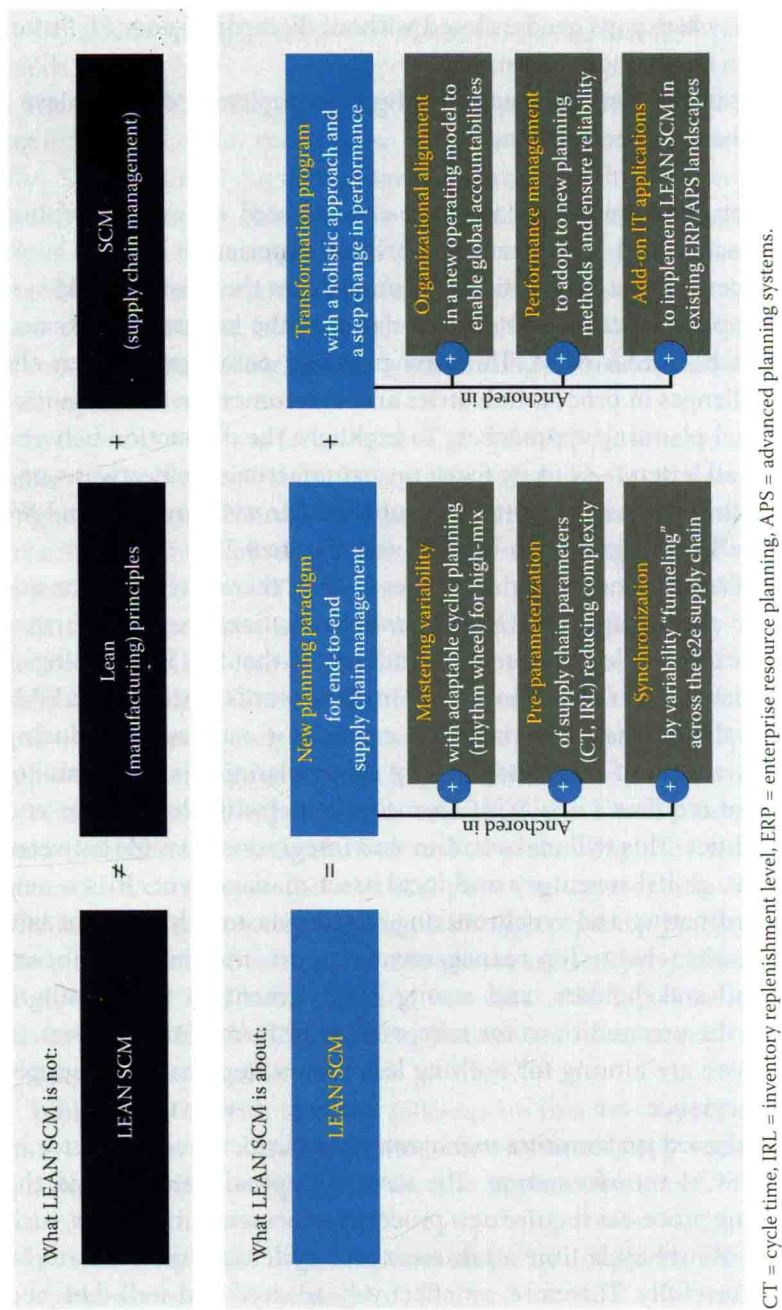


FIGURE 0.2  
What lean SCM and LEAN SCM are about.



We will provide a set of meaningful metrics on the basis of which to generate improved supply chain performance through LEAN SCM. Finally, we depict a pragmatic way of creating the right accountabilities within performance management and show you how to anchor it in your planning organization.

Third, technology is instrumental in helping LEAN SCM create sustainable results. Many lean improvement initiatives depend on few individuals and manual techniques—and if those individuals change positions, much of the planning knowledge, enthusiasm, and leadership are lost. In this light, IT applications are even more critical to capture and standardize processes sustainably in a global end-to-end transformation. These additional *IT technologies* are also supposed to institutionalize LEAN SCM Planning. Applications such as the “Rhythm Wheel Designer” or the “Dynamic Target Stock Planner” provide interlocks with concepts such as cyclic planning and balanced variability management in supply chain organizations, ensuring that common LEAN SCM Planning techniques and best practices have staying power in your SCM organization.

You are holding the results of our LEAN SCM work in your hands right now: it is a holistic practitioner’s guide to mastering variability, uncertainty, complexity, and ambiguity in process industry supply chains. It also includes detailed concept descriptions and process explanations. To make it even more practical and valuable for your own reflection, we have enriched all topics with relevant industry cases. We believe that the performance improvements achieved through LEAN SCM initiatives are best described by your industry pioneers themselves. You can therefore also find in this book accounts of how your peers have already lived the LEAN SCM paradigm, used the relevant instruments successfully, and gained:

- Improved customer service and increased supply chain agility through reduced cycle times for Rhythm Wheel-managed products.
- Significant improvements in overall equipment effectiveness (OEE) through leveled and takt material flows that are synchronized to customer demand.
- Significant reductions in working capital through actionable supply chain analytics on variability and risk allocation of stocks across the end-to-end supply network.

I am certain you will enjoy the same outstanding results along your company's supply chain by reading this book and adopting LEAN SCM—because now you are targeting nothing less than a quantum leap in your operations and supply chain performance.

**Dr. Josef Packowski**  
*Mannheim, Germany*



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# Reader's Guide

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This book will guide your company in undertaking the paradigm shift from traditional planning to LEAN SCM. After learning about and implementing LEAN SCM concepts, your company's supply chain will be able to meet the VUCA challenges of today's global marketplace. You will learn how industry leaders changed their approach to tackle the challenges of variability and uncertainty in supply chain management and how they achieved better customer service at lower cost through LEAN SCM.

In this reader's guide, we provide an overview on

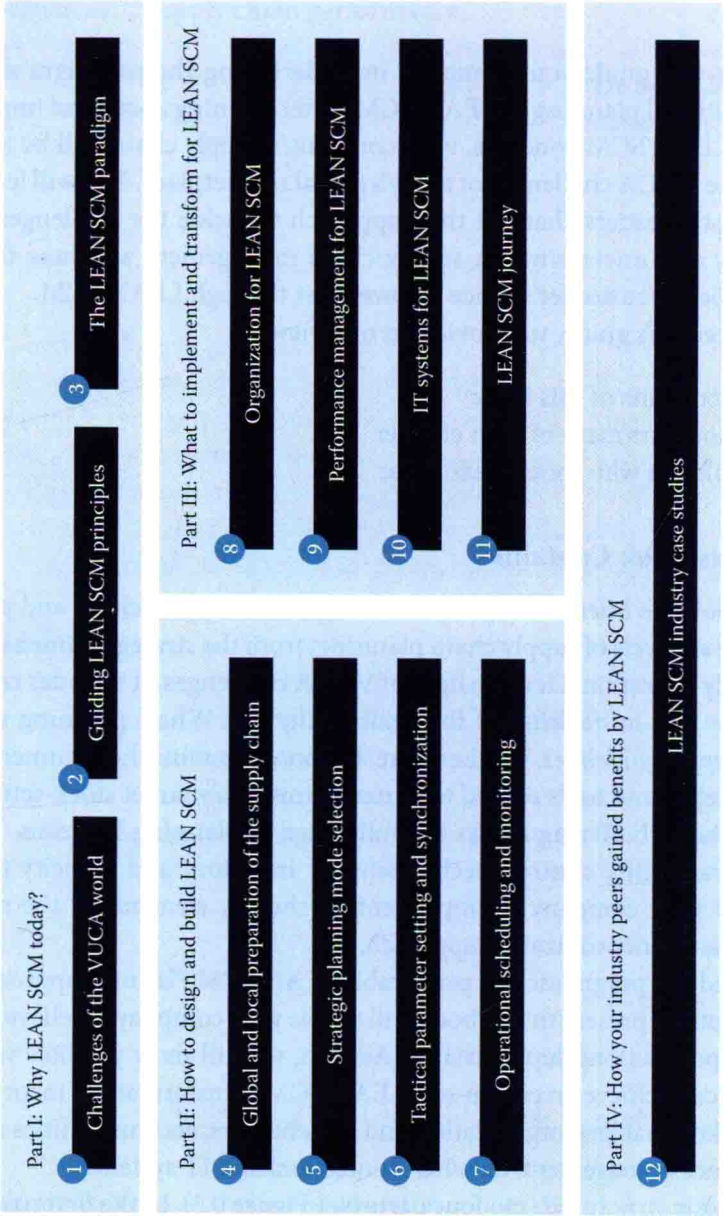
- The contents of this book
- A short summary of each chapter
- A guide to who should read what

## What This Book Contains

In this book, we offer you a practitioner's guide to approaching and preparing for all levels of supply chain planning, from the strategic dimension to the daily operational level in light of VUCA challenges. It includes *comprehensive how-to-do-schemes* for flexible Rhythm Wheel planning and *when-to-apply guidelines*. Furthermore, the book contains the argumentation, concepts, and tools related to dynamic inventory target stock-setting and variability buffering across the full range of planning horizons. We describe variability control mechanisms for inventory and capacity that will allow your company to implement all the key elements of the new supply chain synchronization approach.

Designed as a pragmatic and practicable LEAN SCM Planning approach, the concepts we present in this book will enable your company to relieve the real pain points along supply chains. As such, we will show you how your company can achieve an end-to-end LEAN SCM transformation, incorporating all key enablers: organization and stakeholders, accountabilities and performance management, data harmonization, and IT systems.

The book is structured into four parts (see Figure 0.3). In the first part of the book, we focus on the current challenges in the process industries, the insufficiencies of traditional planning approaches, and the ways in which LEAN SCM overcomes these challenges. In the second part, we outline



**FIGURE 0.3**  
The book is structured into four parts.

how your company should prepare its supply chain for LEAN SCM from a global and a local perspective. We then explain what planning modes you should choose for your company's supply chains from a strategic perspective, how you can synchronize supply chain operations, and how operational planning and scheduling is conducted with LEAN SCM. In the third part, we draw out the implications of LEAN SCM for your organization, describe its impact on performance management, and explain how IT systems support the entire LEAN SCM process. Furthermore, we present valuable recommendations for your own "LEAN journey." In the fourth part, we conclude the book with selected, useful case studies of thought leader companies that have recently implemented LEAN SCM methods.

Overall, this book contains 12 chapters, which are all readable on their own. Each chapter is summarized to highlight the key takeaways, as are the most important sections within a chapter. Also, the book contains a wealth of useful graphics, as we believe they facilitate the understanding of the contents and serve as quick links when you want to locate key points. Furthermore, we have included a number of text boxes, which contain additional and valuable information with interesting insights from companies of the process industries.

## **Brief Chapter Overview**

Over the course of 12 chapters, we explain the need for a paradigm shift in supply chain planning, the way LEAN SCM and the associated concepts work, and what needs to be changed within your company to successfully implement LEAN SCM.

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## **PART I: WHY LEAN SCM TODAY?**

### **1 Supply Chain Management in Process Industries**

In this chapter, we discuss successful supply chain planning as the backbone of modern SCM. As evidence shows, traditional supply chain planning cannot effectively manage the new challenges of the VUCA world, which is an acronym for today's new business reality imposing so much pressure on supply chains. You will see why traditional planning fails and

that the naïve transfer of lean methods to process industries cannot solve these challenges.

## **2 Guiding Principles of LEAN SCM Planning: Facing VUCA Challenges**

LEAN SCM principles are introduced to guide your company along its journey to the paradigm change in SCM in process industries. You will learn about LEAN demand, supply, and synchronization principles and what is fundamentally different between LEAN SCM and traditional planning approaches.

## **3 Fundamentals of LEAN SCM Planning: A Paradigm Shift in Planning**

In this chapter, we show how LEAN SCM ensures resilience along the supply chain against the VUCA world, how LEAN SCM works fundamentally, and what benefits you can expect regarding customer service improvements and greater cost efficiency.

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# **PART II: HOW TO DESIGN AND BUILD LEAN SCM**

## **4 Prepare Your Supply Chain for LEAN SCM**

This chapter describes what your company should do before implementing LEAN SCM. You will see how to align the supply chain strategy with overall business goals, how to prepare the supply chain from a global perspective, and how to prepare local shop floor operations and material flows for LEAN SCM.

## **5 Strategic LEAN Supply Chain Planning Configuration**

Once your company's supply chain is prepared for the transition to LEAN SCM, you need to analyze and select appropriate planning modes according to the specific needs of your supply chain. This approach has proven successful in the past for distinguishing between production and replenishment modes. In this chapter, you will learn how to select the best-suited production and replenishment modes for your company's supply chains.