Kaizen in Logistics and Supply Chains

Euclides A. Coimbra
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## PART ONE

### From *Gemba Kaizen* to Supply-Chain Excellence

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Lean has become one of the most popular management methods for enhancing the competitive strength of manufacturing and logistics companies in the past few decades. Because the introduction of Lean involves all levels of management and employs a number of unfamiliar terms such as kanban, takt time, push, jidoka, mizusumashi, and muda, it has not been easy to understand its full implications.

Consequently, Lean has so far been introduced in bits and pieces in many companies and not as a total supply-chain management system. Although the benefits of Lean are gained only when the web of the total flows has been extended throughout all the supply-chain processes, few companies have realized the full benefit of kaizen in logistics and supply chains.

As a result, very few companies so far have succeeded in embracing Lean as a total system across their entire companies.

Euclides Coimbra’s book, Kaizen in Logistics and Supply Chains, has come at an opportune time, when many companies are going through reexamination of their supply-chain strategies in the aftermath of the financial crisis and the pressures of global competition. Many companies are seeking a road map to enable a quantum leap in improving their supply operations.

Coimbra’s book will be a perfect guide both to those who wish to embrace Lean for the first time in their factories, warehouses, supply chains, or planning processes and to those who have begun their journey but have enjoyed only marginal success in embracing Lean.

The gist of the book can be captured in the following quotes:

“For now, forget about the jargon and the acronyms. We only need to concentrate on making a total flow of materials and information and minimize it.”

“The information of the flow should come from the customer order and not from a sales forecast.”

“By creating and increasing the flow, you can improve quality, reduce cost and inventory, and meet diversified customer requirements in terms of volume and delivery.”

“Lean means to employ minimum resources for maximum output. Lean is what you gain as a result of building a Total Flow Management system.”
Sound simple? Yes, it is, because we are not talking about high-tech solutions but rather about daily, hands-on contacts with the realities on the shop floor. However, it does require everybody’s determination and commitment, which comes from *kaizen*.

*Kaizen* means ongoing, continual improvement and a mindset that is never satisfied with the status quo. *Kaizen* drives everybody to engage in the never-ending *kaizen* in logistics and supply chains. Coimbra says that you have to change the mindset, then change the *gemba* (shop floor), and then change the mindset again.

This book helps readers to review their activities and total supply chains from the vantage point of the *flow* and provides hands-on instructions for how to build a system based on *kaizen* in logistics and supply chains step by step. This book also includes a successful case study of a company that introduced *kaizen* in logistics and supply chains under the author’s guidance.

Sometimes the detailed steps of introducing total flow across the supply chain as outlined in this book may seem to be too complicated and cumbersome, but when you start practicing them, you will find that they work—because *kaizen* also means learning by doing. *Kaizen* in logistics and supply chains is very much an action-oriented program of learning by doing.

I do hope that this timely book will help readers to survive the *Sturm und Drang* period after the financial crisis and build an enterprise of lasting prosperity.

Masaaki Imai  
Founder, Kaizen Institute  
Tokyo
Since I joined the Kaizen Institute Consulting Group in 1998, I have had the privilege of applying kaizen in many corporations worldwide. People’s perceptions of kaizen have evolved since Masaaki Imai first presented the kaizen principles in 1985, and nowadays it is accepted as a fundamental management philosophy.

The meaning of kaizen is “change for the better” or “continuous improvement,” and more and more companies are adopting continuous-improvement (or CI, as it is more commonly known) management systems. In fact, CI is becoming a company strategy dedicated to the continuous improvement of operations, a truly operational strategy based on kaizen principles and tools.

Lean is another way of describing kaizen or continuous improvement, and we often hear of companies implementing a Lean management system (sometimes called a Lean transformation process). Six Sigma is also very popular. Many consulting companies have recently altered their marketing strategy to Lean Sigma, which is supposedly a combination of Six Sigma and Lean. Regardless of terminology, the goal of all these strategies is the same—the implementation of a sustainable operations strategy that delivers extraordinary results in terms of safety, quality, delivery, cost, and motivation (SQDCM).

This is exactly what happened in Toyota with its well-publicized Toyota Production System (and lesser-known Toyota Operations System). The relentless, step-by-step application of kaizen principles changed the company’s culture, defined the way of thinking of all its employees, and produced extraordinary results. Today this strategy has contributed to Toyota’s undeniable global success and its recognition as a true leader in the field of manufacturing. Toyota is a truly dainyo (meaning “by far the best”) company!

Despite the success and popularity of many commercial CI brands offered by consulting companies and adopted by many corporations, it is a fact that few organizations really succeed in changing the company culture to a kaizen culture. It is not easy to fully incorporate a company-wide strategy, particularly one that aims to change the thinking and behavior of all employees and stakeholders. It can take years and should be implemented everywhere, every day, and by everybody (using the words of Masaaki Imai, founder of the Kaizen Institute). If such a culture is achieved, it will from its inception deliver significant benefits to the company, and these will be sustained or increased over subsequent years.
Why do many companies only become healthy and Lean for a while or when it suits them and then, sooner or later, go back to their original, unhealthy status?

This is the aim of the Kaizen Institute: to design and implement sustainable CI strategies that can make modern businesses more competitive.

This book is part of that quest.

It has long been known that, together with the kaizen spirit and mindset, Toyota has a superior physical operations model (as well as a production model), but that it is highly complex. Toyota never made a secret of this extraordinary model, but at the same time it has never made any effort to describe it in an organized, detailed way. Toyota invented the model and just started applying and deploying it in all its operations, whether manufacturing, distribution, transportation, or offices. Taiichi Ohno was the driving force behind this invention in terms of management methods and tools. Once this wonderful new operations model was established, many people became interested in explaining what was happening.

Consequently, there are many books today about Lean and the Toyota Production System. In my opinion, however, the existing literature on the Toyota Production System and Lean is incomplete, in the sense that there is no one holistic model that explains all of their applications in terms of the supply chain. The “production” (or manufacturing) side of the Lean model is well documented, but the link to logistics is less known. Every time we visit a Toyota plant or warehouse, logistics (whether internal or external) is there in action, but most people cannot see it because they cannot understand it in terms of a sound operations model. The model is indeed very different from the current operations paradigms based on central planning and “functional” optimization techniques, which can be seen in 99 percent of operations worldwide.

So we come to this book, in which we talk about Total Flow Management (TFM) and the holistic application of kaizen and Lean to the entire supply chain. Total Flow Management is about incorporating kaizen principles with pull-flow principles to streamline the whole supply chain. It uses the Toyota model to create a flow pulled by customer demand across any supply chain. It also explains the well-known Toyota Production System and its connection to sourcing and delivering, which together make worldwide supply chains a reality.

This book sets out a model for implementing the pull-flow principles in all types of operations. It refers to many improvement tools, some well-known and others less so. It is divided into three parts. Part 1, “From Gemba Kaizen to Supply-Chain Excellence,” begins by explaining the seven main kaizen principles and the importance of really believing in them. On numerous occasions during consulting projects I have questioned my customer’s degree of commitment to kaizen and Lean principles, such as muda (the seven Toyota wastes), visual management, or pull-flow thinking. These principles are regarded as golden rules in Toyota, and no one ever questions or doubts them.
This book then describes the story of Company A, a very successful company that for many years applied Lean but with no concept of kaizen and no true understanding of pull flow. Part 1 concludes by discussing pull logistics loops and the importance of being aware of their existence in any supply chain. They are there, just waiting to be seen, analyzed, and improved.

Part 2, “The Dynamics of the Total Flow Management Model,” is dedicated to an explanation of the TFM model and its underlying four pillars, namely

- Basic reliability
- Production flow
- Internal logistics flow
- External logistics flow

Each pillar is composed of five improvement domains that are presented together with some examples and practical applications. Some improvement domains, such as the single-minute exchange of dies (SMED), are very well known, but others, such as mizusumashi (the Japanese word for “internal logistics standard work”) or pull planning, are less common.

Part 3, “How to Implement Kaizen in Logistics and Supply Chains,” is dedicated to explaining the fifth pillar of the TFM model, which is supply-chain design. The application of the TFM pillars and domains of improvement may vary a great deal depending on the particular type of supply chain (e.g., automotive, consumer goods, or processes and services), and supply-chain design is the way to customize a solution for any type of supply chain. It is based on application of the value-stream mapping (VSM) tool to the supply chain and includes the steps necessary to design a TFM supply chain, just as an architect would design a house before its construction. Building a kaizen pull-flow supply chain is a complex task, and it still amazes me how many companies begin building their “house” with only limited design and planning in place. The part ends by presenting the kaizen pull-flow life of Company A, the company introduced in Part 1. The new structure of Company A was designed and implemented following the TFM model.

Kaizen in logistics and supply chains based on the TFM model is a new operations strategy paradigm that has the potential to create a breakthrough in performance for the twenty-first century. The Kaizen Institute is convinced that 100 years from now this will be the prevailing paradigm in the most advanced supply chains. Why 100 years? It may seem a long time, and let us hope it is achieved far sooner, but consider the following: Toyota started its implementation 60 years ago, and some elements of the system have been well known since at least the 1973 oil crisis. History has demonstrated over and over again that it takes time for new ideas to be fully accepted.

The Kaizen Institute will continue the quest for the development of kaizen and continuous improvement. We hope that this book can be a trusted contribution to the
advancement of operations management and a useful, creative source for implementing kaizen and Lean.

Euclides A. Coimbra
ACKNOWLEDGMENTS

Individually, we are one drop. Together, we are an ocean.
—RYUNOSUKE SATORO

This book is the culmination of many discussions over the last 10 years in the Kaizen Institute Consulting Group. Ultimately, the “several drops” created a mature model. It would be impossible to mention everyone who has contributed, so I will mention only those closest to me.

First, I would like to thank my colleagues from the Kaizen Institute of Portugal under the leadership of Alberto Bastos. On countless occasions we have debated the questions, What is kaizen? What is Lean? We are still searching for a satisfactory answer. My fellow consultants António Costa, João Castro, Tiago Sanchez, Rui Tenreiro, Tiago Costa, and José Pires have readily reflected on this with me and continue to be an endless source of ideas and inspiration.

Other friends from the Kaizen Institute Consulting Group, namely, Carlo Ratto, Ruy Cortez, Vinod Grover, and Udo Reimer, also have made invaluable contributions to furthering the development of kaizen in logistics and supply chains know-how. A special acknowledgment must be made to Danie Vermeulen and Richard Steel from the Kaizen Institute of New Zealand for their extraordinary support in reviewing my manuscript in terms of both its English and the clarity of the concepts covered.

In addition, I would like to thank Masaaki Imai for his boundless energy and enthusiasm when explaining the kaizen principles and for stressing the importance of flow, synchronization, and leveling (FSL), the basic principles behind kaizen in logistics and supply chains.

This book would not have been possible without the involvement of our customers and the rich experiences they provided to our consulting gembas. As I have often commented, the only way to continue learning is to continue doing stressful, difficult jobs. To this end, I would like to thank Mário Pais de Sousa, João Paulo Oliveira, Lázaro Sousa, Patrick de Bruyne, Filipa Pimenta, António Sá Cunha, and Horácio Sousa for the challenging projects they entrusted to us.
Writing a book is never easy, particularly when you are managing a global consulting company at the same time. I have achieved this with the help of my family, so I am indebted to my wife, Luisa, and my daughters, Silvia, Luisa, and Helena, for their unwavering love, support, and encouragement.
CHAPTER 1

Kaizen for Pull and Flow Across the Supply Chain

The meaning of the word *kaizen* is “change for the better.” It is a concept that today is being implemented by more and more people and organizations worldwide. Ever-increasing global competition and the information technology (IT) revolution have resulted in many challenges and stresses. More and more, businesses and individuals see the pursuit and achievement of the *kaizen* principle as a potential solution.

*Kaizen* is also known as *continuous improvement*. Masaaki Imai, founder and president of the Kaizen Institute and author of the world-famous books *Kaizen: The Key to Japan’s Competitive Success* and *Gemba Kaizen: A Commonsense Approach to a Continuous Improvement Strategy*, says that *kaizen* is not simply continuous improvement but is improvement every day, everywhere, for everybody. *Kaizen*, in fact, can embody a way of life for modern corporations so that change for the better becomes a daily habit of continuous improvement.

This is precisely what the Toyota company has developed over the last 60 years in its Toyota way of management, in which continuous improvement is a daily occurrence. Toyota began implementing *kaizen* shortly after World War II. Many stories are told about Japan’s relentless efforts to increase its economic competitiveness after World War II, particularly in relation to the high productivity of Germany and the United States. Toyota’s aim was to make the rising Japanese automotive industry a success. Today, after more than 60 years of *kaizen*, Toyota is the undisputed leader of the automotive industry worldwide.

We can see the *kaizen* spirit behind the ground-breaking discoveries of Taiichi Ohno at Toyota, who developed a new way of organizing manufacturing and logistics—the Toyota Production System (also known as *Lean transformation*), which is based on creating a flow...
of materials and information. Melding this system with the principle of *kaizen*, or the continuous improvement of operations, has brought about the most powerful operations strategy ever developed, as this book will show.

Based on our experience of implementing *kaizen* and Lean since 1985, we at the Kaizen Institute have developed Total Flow Management (TFM), a detailed model that allows the smooth implementation of the Toyota Production System not only inside manufacturing plants but also across complete supply chains.

We believe that TFM, which has its roots in *kaizen* and is a new way of organizing operations based on the creation of pull flow (a new operations system paradigm), is by far the best way of managing the operations of any company.

Before I explain TFM, though, I want you to look at the effects of resistance to change and consider the nature of paradigms.

**Paradigms**

The Lean system, or Lean transformation, is another name for the Toyota Production System. However, the system is not well described or understood—and therefore not very well established.

Anyone who has ever tried to promote and implement a new idea knows how difficult it can be to get the idea accepted. People simply resist change, and the reason they do so has to do with paradigms. A *paradigm* is a way of thinking (based on our values and beliefs and reinforced by standards, habits, and past results) that influences how we interpret a given situation or problem. When we react to a situation in a habitual way, this is called a *paradigm*. Each person reacts to events according to the particular paradigm he or she has adopted.

I prefer to simplify the concept of paradigms and just say that we all have two types of habits: physical habits and thought habits. And when we are confronted with a new idea, in most cases we react according to our habits. Carol S. Dweck, in her book *Mindset: The New Psychology of Success* (Random House, 2006), says that there are two types of people: those with fixed mindsets and those with growth mindsets.

People with fixed mindsets have rigid habits of behavior and thought that have provided some good results for them in the past. These people have difficulty in changing their habits (and, as a consequence, adopting *kaizen*). They believe that they already know all they need to know, and they find it hard to accept new ideas. They live with inflexible paradigms and are not open to change.

People with growth mindsets are the ones who are more ready to adopt *kaizen* because they are willing to change their habits and take on new, better ones. They are open to accepting new ideas and to learning new things. They live with flexible paradigms and are open to change for the better.
History shows us many examples of resistance to change and resistance to the adoption of new ideas or systems (let's call them new paradigms). In his book *Paradigms: The Business of Discovering the Future* (HarperBusiness, 1993), Joel Barker tells many such stories—the resistance Galileo encountered when he presented his theory that the earth revolved around the sun, for instance, or the refusal of the Swiss watch industry to adopt the quartz watch technology invented by a Swiss research laboratory—and other examples where people couldn't see and accept new, emerging ways of doing things, new paradigms that could change their industry and the world.

One of these stories that I like the most is about the change from wind-powered to engine-powered ships. In an effort to improve the speed of sailing ships, people tried to develop an old paradigm and improve it to its absolute limits on the basis of “more of the same.” In this instance, the old paradigm, in the fifteenth century, stated that the more sails a ship had, the better its speed and performance would be.

Following this paradigm, for many years ships were built with more and more sails, to the point where a single vessel had a huge number of sails in order to take the fullest possible advantage of the wind. There was, of course, a limit to this. This is called the limit of the current paradigm.

While all these super-sail-powered boats were being developed, a new paradigm was emerging: What about a ship without any sails? This type of thinking, where you question the existing solution, is the kind that promotes and opens the mind to the adoption of new paradigms. Our current paradigm, of course, is for ships without sails. The big cruise and cargo ships that cross the oceans are propelled by powerful diesel engines, another new paradigm for powering ships (although no longer so new in the twenty-first century). The time will come when someone invents a commercial ship without a combustion engine. There are already nuclear-powered submarines.

The current paradigm in operations management is the no kaizen, no pull-flow paradigm. This tells us that there is no time for improvement and that an operations system that is based on big batches and order forecasts is the way forward. This is the reality on most shop floors, both in manufacturing and in logistics. People do listen to new ideas and are usually open to discussing them, but deep inside, the prevailing paradigm is still the old no kaizen, no pull-flow system (we call it the push system). This is why it is so difficult to implement the new kaizen, Lean, or Toyota Production System ideas, especially those related to supply-chain and logistics systems based on pull flow.

Let's take a closer look at the solutions used in the old paradigm. The old paradigm talks about big batches, so let's talk about unit batches (yes, batches of one unit of product). The old paradigm talks about order forecasts, so let's talk about no order forecasts (using only final customer orders). The old paradigm talks about no time for staff to be involved in kaizen, so let's talk about involving people, promoting awareness of muda (waste), and making kaizen a natural way of working.
Let's adopt a growth mindset and look in detail at the new Total Flow Management paradigm for the organization of supply chains. I promise you that it will open up new horizons.

**Kaizen Principles in the Supply Chain**

The *kaizen* pull-flow paradigm was developed by the Toyota Motor Corporation and applied to all its supply chains. It is a completely new operations model based on creating a flow that is *pulled* by real customer orders and on continuously improving this flow.

Creating a flow means creating a movement, both of materials and information, across any supply chain. This movement of materials and information should be driven by real customer orders or real customer consumption.

This means that in a supply-chain environment, movement of materials and information starts with the customer. Consumers buy (pull) products (materials) from the retail stores, the retail stores pull stock from the product distribution centers, the distribution centers pull from the manufacturing companies, and the manufacturing companies pull from their network of suppliers. This describes the flow in a simplified supply chain (a real supply chain probably will have many more elements in the chain both before and after the point of the final manufacturing facility).

This is the system Toyota developed and applied in its supply chains, starting with the car dealers and going back to all its suppliers. It’s a system whose underlying principles are pull flow (one-piece flow pulled by consumption) and a strong engagement in *kaizen* everyday, everywhere, by everybody in the supply chain.

To put such a system into practice, companies need to develop a strong commitment to some *kaizen* pull-flow principles. These principles include

- Quality first
- *Gemba* orientation
- Waste elimination
- People development
- Visual standards
- Process and results
- Pull-flow thinking

Let me explain what I mean by these.
Quality First

This is a very important principle—a classic belief in terms of kaizen. From the very beginning of the quality movement, led by gurus such as Crosby, Deming, Juran, Ishikawa, and others, quality has been one of the most important factors in kaizen. This belief is supported by three concepts:

▲ Market in.
▲ The next operation is the customer.
▲ Upstream improvement.

The principle of market in (as opposed to product out) states that it is both possible and necessary to use real factual data to understand customers' quality, cost, and delivery (QCD) needs and to anticipate and understand their unstated wants and needs. In fact, a wonderful example of market in can be seen in Apple and the development of the iPhone. It is said that Steve Jobs, the cofounder of Apple, doesn't believe in market studies and prefers to develop products based on the idea of creating a superior customer experience. This is a type of market in showing that he really anticipated and understood unstated customer wants and needs—and developed a superior mobile phone as a result.

The principle that the next operation is the customer is also very important because it transforms the company into a chain of suppliers and customers, with each supplier doing its own market in and delivering zero defects to the customer.

Upstream improvement is the idea that the cause of any problem or defect is usually found at some point earlier in the process. To really find the root cause of any difficulty with the process, you have to dig hard further up the line.

“Quality first” is one of the most venerated beliefs at the Toyota Motor Corporation. Unlike pull-flow thinking, the quality-first belief is now almost universally accepted.

Gemba Orientation

Gemba orientation means “go to the gemba (the real place, the shop floor, the place to make improvement) and change the working habits of people for the better.” There are two ways to change these working habits: Either we immediately change the physical layout so that people have no option but to work differently, or we change a work standard and train people to follow this new standard until it becomes a habit—and, in fact, a new working paradigm.

Gemba orientation is also the belief that reality is stranger than fiction. This means that what we think is happening in the gemba is usually quite different from what is actually taking place.
Taiichi Ohno used to say, “People’s ideas are unreliable things, and I would be impressed if we were right even half the time. . . . Very often, after we try, we find that the results are completely opposite to what we expected, and this is because having misconceptions is part of what it means to be human.”

This is why the following *gemba* orientation attitudes are so important:

- Going to *gemba*, the actual place where things are happening
- Thoroughly observing the reality
- Checking the *gembutsu* (the real things, the elements of that reality, such as tools, materials, and information)
- Speaking from the basis of observed and validated data

*Gemba* orientation also means that if you desire to see, learn how to act. In other words, if you truly want to understand a new idea without misconceptions, the best way is to try it and learn how to do it yourself. The learning process of actually putting the idea into practice will result in a much deeper understanding.

At the Kaizen Institute, we involve people in what we call the *gemba kaizen* workshop. This is an intensive period of work undertaken by a group of people whose aim is to design and implement improvements within a short time frame (usually up to five days). The workshop is preceded by preparation days with a group leader. Afterwards, there are follow-up sessions with the group to reinforce and train the new standards so that strong new habits are established.

**Waste Elimination**

*Waste elimination* is the first pull-flow-related *kaizen* principle. *Kaizen* defines seven forms of waste and targets their elimination as a way of achieving competitiveness and excellence. These seven wastes include

1. Defects (internal or external failures of quality)
2. People waiting
3. People moving
4. Too much processing
5. Material waiting
6. Material moving
7. Overproduction

In all the *kaizen* and Lean literature, you will find that these seven types of waste are part of a broader concept—that of the three *Ms*: *muda*, *mura*, and *muri*. 
Muda, we already know, means “waste.” Mura means “variability” and is a concept that represents the lack of stability and reliability. Too much mura means too many unexpected variations from moment to moment. For example, one moment a machine is under control, and the next it’s not. And then it’s under control again, even though you did nothing.

Muri means “too difficult” and stands for the concept of time and energy loss. A bad ergonomic position in a workstation that requires the worker to bend is a waste of time (the movement has to cover a greater distance than necessary), a waste of energy, and a risk of injury (because the energy required for the movement can go over the threshold of the individual’s capacity).

So the three Ms consist of the seven types of muda (waste), mura (variability, or the lack of reliability), and muri (loss of time and waste of energy).

Some authors, such as Taguchi, even talk about measuring variability in terms of loss to society. The greater the standard deviation of a quality variable, the deeper is the feeling of loss the user will experience.

One thing I always question is the degree of commitment people have to the seven types of waste. In my experience of working with companies to implement a world class business management system and various improvements, people have no problem accepting and believing in wastes one through four. These four kinds of waste are widely accepted. Nobody questions that defects, people waiting, people moving, and too much processing should be eliminated (or at least reduced).

In contrast, wastes five through seven are not so easily accepted. Let’s look at each of these wastes one at a time.

Muda 5: Material Waiting

This is more commonly known as stock or inventory. I prefer to call it the muda of material waiting because while material is standing, nothing is happening, the material is not being transformed, and no value is being added. Why don’t people accept this as a waste? Because they have learned that inventory has a purpose or is a consequence of the optimization of another variable (such as machine or plant capacity). These may be valid reasons not to believe that inventory is a waste. But what if the same process could be achieved with lower inventory—and what if the machine or plant capacity were independent of the amount of inventory?
Muda 6: Material Moving

This is also known as transport. I call it material moving to stress the fact that here, too, no value is being added because no transformation is happening. Some types of transport are considered a waste, and people have no difficulty in accepting this. Generally, however, getting people to accept the concept of transport as a waste is difficult. People tend to believe that the number of situations where movement is clearly waste is less than the number of situations where the movement is necessary, and they see no alternative solution. One typical comment is that all logistical activities should be considered waste. This thinking rings alarm bells because it indicates that people don’t really believe that transport is a waste. We will see later how this type of belief can be changed.

Muda 7: Overproduction

This muda refers to the accumulation of inventory through an error in forecasting customer demand and production capacity or an imbalance between machines or for many other reasons. This is a type of inventory, and the same reasoning applies as for waste number five. People have difficulty accepting that too much production is a waste. They tend to feel that at least when a customer order comes, the product is already available, and they don’t need to bother making it.

What happens is that wastes five, six, and seven are not easily seen as waste. Most people consider that material waiting, material moving, and overproduction are features of the system that provides the goods to society. They have a hard time accepting that these kinds of waste can be reduced and don’t really think that it is possible that they can be eliminated. It is a problem of mindset.

By trying to eliminate all muda, Toyota invented a new operations system whose fundamental guiding principles are the seven plus two wastes and applied it to all the Toyota supply chains. The results the company has achieved are amazing—and the basis of it all is strong beliefs and a lot of practice and reinforcement.

People Development

This principle places a great deal of emphasis on the involvement of people in the improvement activities. The most important aspect is that working in teams and developing people ultimately result in the development and adoption of new habits of working that improve quality, reduce costs, or improve customer service—or achieve all three.
The first step in changing a habit is to become aware of possible improvements. For example, a product-changeover operation occurs on many machines or lines. The people doing the changeover are not usually aware of the importance of reducing the changeover time or of their way of working because they do it automatically (this, after all, is the definition of a habit). When we involve them in the improvement effort, we show them a film of a changeover. By observing what actually happens during a changeover, they begin to develop an awareness of all the wastes and inefficiencies that take place—which is the first step toward improvement.

For new habits to be adopted, everyone in a company, from top management to the shop floor, needs to be involved. The way to do it is by organizing kaizen-focused teams. Developing people through teamwork is one of the strongest principles of kaizen.

**Visual Standards**

The *visual standards* principle embodies the concept that a picture is worth a thousand words and that a standard is the most efficient known way of performing a task. It’s as simple as that. First, it is very important to define the most efficient way of performing a task. If the task is not standardized, it is usually prone to variability (a key kaizen concept). When several people perform a task, each one probably will have a different way of doing it.

The visual aspect of the standard is also important. A standard that is based on pictures, drawings, and creative word pictures is quickly and easily understood, unlike the text-based descriptive standards and instructions we see in many gembas.

*Standard work* is a special type of visual standard. Standard work represents the optimization of the movements of workers (according to a certain cycle time and following some rules for maintaining a good flow of materials). In a standard-work standard, it is easy to observe the movements of a worker, how much time the action takes, and other important information relating to the maintenance of material flow. We will come back to standard work and its important connection to pull flow later.

**Process and Results**

*Process and results* is another very important kaizen principle. Many managers believe that defining the target is all that is necessary; the method of achieving the result is not important. They say, “I don’t care about the method (process)—just deliver the results!”
However, if you are really serious about kaizen, you have to look in detail at the process and analyze the ways to improve it. Just imagine that you are a golfer wanting to improve your handicap. What do you do? Do you focus only on the handicap you get, or do you establish a strong connection between the process that you are following and the result that you are achieving?

You will probably think about improving the process in terms of posture (swing), equipment, and even mental preparation. Only by working on process improvement can you achieve good results. It is this focus on improving process details that will bring extraordinary results.

In fact, process-and-results thinking assigns equal importance to the process and the result. The result is also important, in the sense that it is a commonly agreed target for the team or group (the company)—a kind of north star that gives you direction. It also allows you to check whether the process improvement is having the right effect.

**Pull-Flow Thinking**

Now we come to the really controversial principle. Very few people really believe in pull-flow thinking. Pull flow means organizing all your supply chain (or, to simplify and narrow the concept, your internal logistics and manufacturing flows) in terms of an optimal material flow and an optimal information flow. To achieve this, the emphasis must be on eliminating the muda of material waiting—in other words, your inventory. The term pull means that the material flow should be pulled and initiated by customer consumption or customer orders.

The idea of material flow—ideally, a one-piece flow all across a supply chain—frightens many people. From their school years, people have been told that processing a batch is more economical than producing a single unit. People believe that it makes sense to think in these terms, when, in fact, it simply looks more efficient to work in this way. In terms of information flow, too, it seems strange to consider working according to customer consumption or orders because these usually mean a relatively small quantity, and so once again, there is a feeling of inefficiency. Many people are still stuck in the old paradigm of demand forecasts and batch-and-queue flow.

Pull-flow thinking is the essence of the Toyota Production System. In this book we will see why and how it works. For the moment, just remember that for Toyota people, this is the number one principle. The Toyoda family and Taiichi Ohno started thinking in this way and through trial and error invented a radical new method of organizing operations that continues to produce outstanding results. This has become known as the Toyota Production System—a more appropriate name for this would be the Toyota Operations System or the Toyota Supply-Chain System. In this book we describe it as TFM—Total Flow
Management, based on the latest developments of pull systems over the Kaizen Institute’s experience of 25 years.

Adopting the Kaizen Pull-Flow Principles

Most managers we meet don’t have a full understanding of and belief in the seven kaizen principles. In many cases, they simply don’t understand what these principles mean. Therefore, they can never fully benefit from the indisputable value of applying them. This is why it is so important for managers to make an effort to learn about these principles.

So what is the best way to acquire the kaizen pull-flow ethos? It is a process in which you have to change your mindset, then change the gemba, and then change your mindset again. I mean that you have to start by trying to change your thinking through reading (in fact, reading this book is a good first step toward acquiring the kaizen principles). Being exposed to new ideas and concepts is also important. This could be in the form of, for example, benchmark tours or visits. It is also helpful to talk to a Toyota manager or anyone involved in a pull-flow operation. If you have the opportunity to visit a Toyota plant (or supplier), you probably will see all the principles working on the shop floor.

But there is no substitute for the real thing. To really learn something, you have to do it, experience it. A kaizen expression says, “If you desire to see, just learn how to act.” If you really want to understand, you have to practice and live the real thing—you have to be exposed to the gemba reality.

The best way to demonstrate the value of the system is through a gemba kaizen workshop. I talked about these workshops earlier. They involve an intensive implementation session involving key people in the organization who need to identify the waste, eliminate it, and then maintain the new process. There are many types of kaizen workshops; later in this book I’ll cover which are the most appropriate for building strong pull-flow beliefs. For the moment, just remember that if you want to understand the process, you have to apply it and do it, probably on a limited scale or as a pilot project, and then learn from the experience. Toyota was a pioneer whose ideas are now much easier to implement, but why not be a pioneer and an innovator in your own industry?

Keeping the System Going

Once the system has been established, there is the question of keeping it going. We call this sustainability. We hear many stories of companies that have tried this process but were not capable of maintaining it. When this happens, it’s because people have gone back to their old beliefs and habits—a case of not being able to adopt the new kaizen in logistics and supply chains paradigm of TFM.
One of the reasons this happens is that the implementation focused only on a few points and was not a complete pull model. If you really do a full implementation, you are in fact changing the operations system in its entirety. All its subtle nuances will be altered, and all functions will be involved, from operations planning to purchasing through to product and process design, as well as all the manufacturing functions. Some people call this a Lean transformation, but to be genuinely successful, it has to be a Lean pull-flow transformation.

Many Lean projects and Lean transformations follow the Christopher Columbus model. Winston Churchill rightly pointed out that when Columbus set out across the Atlantic to the Americas, he didn’t know where he was going; when he got there, he didn’t know where he was; and when he returned, he didn’t know where he had been—and he did it all with borrowed capital.

Unfortunately, many Lean transformation projects are done in this way, and only a very limited number have the luck of Christopher Columbus in developing a really sustainable new system that represents a breakthrough in results.

Another factor that works against the success of many Lean transformation projects is the limited scope of the approach. The implementers simply forget to include the customers (the delivery supply chain) and the suppliers (the source supply chain) in the system design.

The Structure of Kaizen in Logistics and Supply Chains

The approach to kaizen in logistics and supply chains via the TFM system is one that includes the entire supply chain of a given company. The starting point for the design is the point where you are located in the supply chain. Maybe your organization is a manufacturing facility or a product-distribution facility. By applying the model, you will be creating your internal pull-flow system and also considering how you can expand this model, both downstream of your supply chain (what we call the delivery side of the supply chain) and upstream (the source side of the supply chain).

The basic TFM model is shown in Figure 1.1. This diagram shows the different supply-chain flows from the perspective of a single manufacturing plant. The delivery of raw materials and components from suppliers to the plant is shown as regular, high-frequency transport loops. Manufacturing is pulled from the retail customer on the basis of continuous real demand requirements (execution orders). Similarly, forecasts are also sent from retail customers, to be used for capacity-planning purposes only—not to drive actual production.
The main target is the reduction of the total lead time in the supply chain. The measure of lead time is the inventory coverage across the entire supply chain (this can be measured in days). It is called lead time and not coverage because the inventory coverage is usually a good estimate of the time it takes one individual product unit to cross the chain.

Reducing lead time also eliminates the waste of waiting and really means creating a material flow. Rigorous systems, processes, and standards are required to create and maintain this flow and to ensure

- Reduced cost
- Reduced working capital
- Increased productivity
- Improved quality
- Higher levels of customer service and satisfaction

This is achieved by creating a flow across the entire supply chain, starting with customer consumption—that is, production can be driven by real orders or inventory-replenishment orders. It will be necessary to physically create one-piece flow, one-container flow, and one-
pallet flow and to accelerate this flow by redesigning transport routes using the concept of high-frequency transport loops (another solution many managers find hard to accept).

Forecasts will no longer be used for creating production or distribution orders; rather, they will be used only for capacity management.

At the same time, the system works to change the company culture to one that is based on the kaizen spirit of improvement every day, everywhere, and by everybody.

In the following chapters we will see how this can be achieved.
CHAPTER 2

The Story of Company A: No Kaizen, No Pull Flow!

Before providing a detailed presentation of the Total Flow Management (TFM) model, I want to tell you the story of a no kaizen, no pull-flow company.

Company A is a very well-respected company belonging to one of the largest corporate groups in the world. The company was founded in 1977 in a small European country and started operating under license from the corporate group. The company was at that time owned by the founding family.

The founding family had high hopes for development of the company, which produced water-heating devices such as water heaters and boilers for the domestic appliances market, and worked hard for many years to achieve this. Between 1977 and 1988, the company became the market leader in the country, with a sound business and a respected trademark. The owners were, however, concerned about quality issues and made quality one of their key areas for improvement. The local university was brought in to build a database of quality defects, and a concerted effort was made to find and eliminate internal and external failures. These methods were very successful and yielded excellent results for many years.

In 1988, the company was bought by the corporate group that had been licensing the brand and providing some of the technology for a number of years. The original CEO from the founding family became the general manager, and the company became the biggest and best plant in the group.

Since its inception, Company A had been a model organization, with a very good social climate in which everyone worked hard for the success of the company. The general manager continued his existing policy of excellence, now reinforced by the values, mission, financial power, and technical and organizational know-how of the corporate group.

Company A had always been very profitable; joining the corporate group created new horizons and new opportunities. Company A quickly became a product-development center for the corporation, exporting to all European markets and soon dominating the European market.
Process Improvement

The story of Company A is clearly that of a very successful and profitable business—in fact, one that was used to increasing productivity by a minimum of 10 percent every year. Why, then, did this company suffer from a lack of kaizen and pull flow (as noted in the chapter title)?

After the initial years of strong investment in quality improvement (we have to remember that the 1980s were the heyday of Total Quality Management [TQM] and many other quality initiatives), Company A started looking for other ways to increase its performance. At the beginning of the 1990s, the company introduced a two-bin system to reduce the stock-outs of components supplied to the assembly lines and began to make some smaller improvements in the productivity of the assembly lines.

At the same time, an important project was started in the press section, aimed at cutting the changeover time in the stamping presses by half (from about two hours to one hour). Some projects to implement one-piece flow cells also were initiated and achieved a high level of integration of operations. Some bending cells and subassembly cells were created, with very good results.

This strategy of improvement continued steadily from the very beginning of the company through to the end of the 1990s. Every year the company saw an overall improvement in productivity of around 10 percent, with continuous improvement in quality and customer service. Meanwhile, a big drive on product development launched many new products and established Company A as the biggest and most profitable plant in the corporation.

By the end of 1999, the main key performance indicators (KPIs) of the plant were as follows:

- Total inventory coverage (raw materials plus work in process plus finished goods) 50 days
- Internal defects rate 12,000 parts per million (ppm)
- Customer service level 91 percent
- Achievement of the assembly production schedule 50 percent
- Productivity 70 parts per operator
- Final assembly-line efficiency 75 percent

All the KPIs showed a good trend until the end of 1999, but from 2000 on, it became more and more difficult to create further improvement, and all the KPIs reached a plateau. It looked as though the initial improvement streak had ended.
By this time, the company was using a lot of Lean tools. The main ones included

▲ Quality problem solving
▲ Single-minute exchange of dies (SMED)
▲ Integration of operations into one-piece flow lines
▲ A two-bin system (full-box/empty-box kanban)
▲ Maintenance improvement
▲ A scheduling and synchronization system (I will discuss this system in more detail in due course)

This company had invested considerable efforts to change its approach and develop new initiatives. Why was this not enough to sustain the improvements?

The Supply Chain and Logistic Loops

This is a good place to analyze the supply chain of Company A. As a marketer of consumer goods (i.e., water heaters), the plant has a product distribution center (PDC) on site. This warehouse is divided into two areas: one for distribution direct to customers (product installers and retail stores) and another for in-transit storage to PDCs in other countries. Thus the customers of the plant also can be divided in two groups: direct and final customers nationally and PDCs belonging to the same corporation but sited in other countries. These PDCs receive the goods and store them ready for delivery to customers in their own countries.

Company A has four final assembly lines, three for water heaters and one for boilers. Each line operates on a cycle time of about 30 seconds and assembles about 2,500 products per day. The suppliers of these lines can be divided into three groups:

▲ Parts preassembled (in four preassembly lines)
▲ Parts manufactured internally (the degree of internal manufacturing was relatively high because the main parts were manufactured within the plant)
▲ Parts bought from external suppliers

For the sake of simplicity, let's say that the final assembly lines have the same three types of suppliers: preassembly lines, internal suppliers, and external suppliers. The preassembly lines are supplied from both internal and external suppliers.

The size of the finished product is about 3 feet × 1 foot × 1 foot. The biggest part, the metal cover, is of approximately the same dimensions as the finished product. Other parts inside (e.g., the copper burning chamber) are about one-third the size of the product. The number of finished-goods references (or stock-keeping units [SKUs]) is about 600.
Note: Here I would like to introduce the concept of logistics loops (LLs). Pull logistics loops are a conceptualization of several pull-flow operations that are an essential part of any supply chain.

Figure 2.1 shows how Company A's supply chain can be divided into four main types of logistics loops types of logistics loops (LL1 to LL4):

LL1—picking and delivery of finished goods (FGs)
LL2—assembly of FGs
LL3—internal subassembly and manufacture of parts
LL4—buying of parts from external suppliers

**Logistics Loop 1: Picking and Delivery of Finished Goods**

LL1 for Company A can be defined as

1. The loop starts with the final customer order (the final customer here is the retail or product installer who buys the product from the corporation).

![Diagram of logistics loops](image-url)