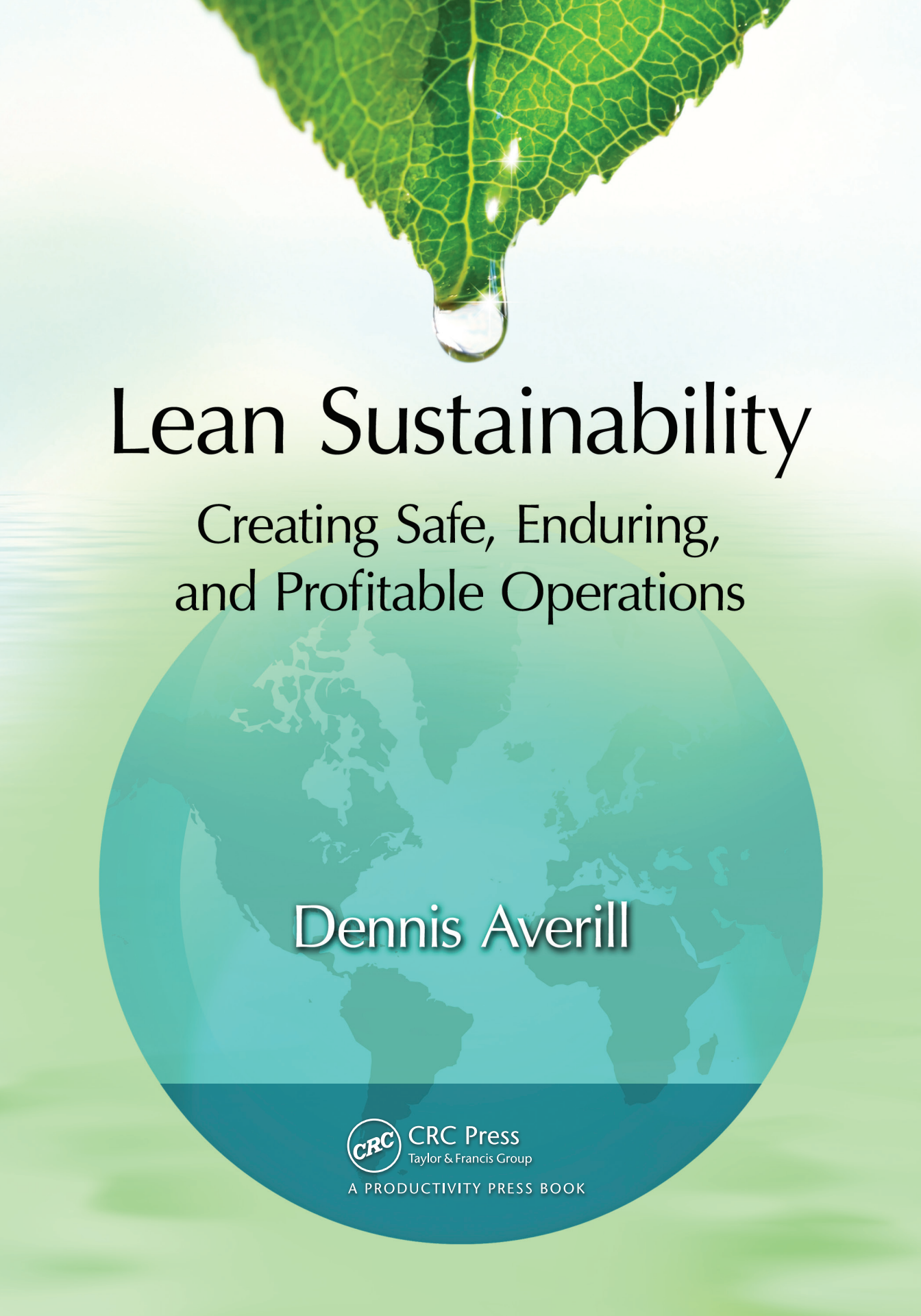




Lean Sustainability

Creating Safe, Enduring,
and Profitable Operations

Dennis Averill



CRC Press
Taylor & Francis Group

A PRODUCTIVITY PRESS BOOK

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Boca Raton London New York

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Taylor & Francis Group, an **informa** business
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CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

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Version Date: 20110727

International Standard Book Number-13: 978-1-4398-9529-0 (eBook - PDF)

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To the giant, Ed Averill; it was only by
standing on his shoulders that I was able
to see farther and more clearly.

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Preface

For many years it was a common belief among American business leaders that it cost extra to make a quality product. For some companies, most notably those in the American automobile industry, this mistaken belief led to shrinking sales, lost market share, vanishing profits, and in a few cases almost to the ultimate demise of the entire business enterprise. After suffering a few hard lessons at the hands of global competitors, it is commonly accepted among today's titans of industry that outstanding product quality is not a luxury but a necessary and integral ingredient for sustained business success. To ignore product quality is considered folly, and a quick path to the unemployment line.

Unfortunately, some business leaders still contend that protecting employees and the environment, and conducting their operations in a sustainable fashion are barriers to business success. These myopic managers maintain that safety and sustainability are extra work that require additional resources and divert business efforts away from the primary job of building efficient and profitable operations. The purpose of this book is to dispel the myth that safety and sustainability are contrary to business success. The hope is that after reading, reflecting upon, and applying the principles and approaches advocated in this volume it will become eminently clear that any business person who ignores safety and sustainability is as imprudent as one who ignores quality.

The keys to achieving safe, sustainable, and profitable operations are integrating and leveraging Lean methodologies in all areas of the business. Safety and sustainability are not additional or separate work, but rather, they are the way one runs a “Lean, Green, and Serene” enterprise. Lean, SHE (safety, health, and environmental protection), and sustainability focus on similar objectives:

1. Eliminating accidents, incidents, waste, and losses
2. Increasing operational efficiency
3. Conducting business in a sustainable way that conserves resources and reduces the business's environmental footprint

By linking an organization's Lean, SHE, and sustainability processes, natural synergy and efficiency are created that benefit all areas of the business and offer the enterprise a real prospect of achieving sustained profitable growth, or, as is commonly expressed, "The opportunity to do well by doing good." However, as with any complex business endeavor, realizing the vision of "Lean, Green, and Serene" is easier said than done. In other words, the devil is in the details. Excellence in productivity, SHE, and sustainability are not achieved by exhortations to do better, or by setting meaningless targets, but rather by doing the hard work to implement business systems that systematically and relentlessly identify and eliminate risk, waste, and losses from the workplace.

Many books and periodicals have been written on the theory of Lean and the conceptual basis of SHE excellence and sustainability. However, few resources are available that provide practical, detailed, real-world methodologies and tools for integrating these three disciplines and realizing safe, sustainable, and profitable operations. My hope is that this book will be the key for your organization that unlocks the vault containing the secret recipe for safe, sustainable business success. This publication is the product of over 20 years of experience with implementing Lean, SHE, and sustainability processes in the chemical and consumer products industries. I hope you find the hints and lessons I share to be helpful for you and your organization's journey toward "triple zero": zero accidents, zero incidents, and zero losses.

It is my firm belief that any organization that hopes to call itself great must value people, the planet, and posterity. The "Lean, Green, and Serene" philosophy and approach detailed herein provide a path to organizational greatness, where a business can do well financially by doing good for people and the planet. I believe if you follow this less-traveled path you and your organization will achieve sustained profitable growth. You, your family, your fellow employees, the planet, and future generations will be glad that you took up the challenge to be "Lean, Green, and Serene."

Acknowledgments

Virtually everything I have learned I have learned from others. This is certainly true of my knowledge related to Lean, SHE, and sustainability. My first safety teachers were my parents and my siblings, to whom I am most indebted. Without their frequent and timely intervention and sincere safety admonitions in my formative years, my passion for safety and sustainability may never have blossomed. This is doubly true for my father, Ed Averill, who not only provided a healthy dose of fatherly advice, but as an industrial hygienist and SHE professional for Mobil Oil provided me with an interest in manufacturing and a passion for safety at a young age. As a novice professional in the field following in his footsteps, he served as a much-valued professional mentor.

I also learned much from many of the SHE and Lean professionals I have trained and worked with over the years who were unselfish in their advice and their willingness to engage me in lively, and I'm sure at times tiresome, debate on technical issues. Although they are too numerous to mention, I will take the time to credit those who have had a significant impact on my professional development, and on the crystallization of my thoughts related to Lean, SHE, and sustainability. I am indebted to my graduate school instructors and colleagues, Dr. Morton Corn, Dr. Charles Billings, and Dr. Patrick Breyse of the Johns Hopkins Bloomberg School of Public Health. I am grateful to my professional colleagues and confidants, Ned Berg (classmate and consultant), Bernie Silverstein (Brookhaven National Laboratory), Chuck Brehm (American Cyanamid), and Alan Weikert (American Cyanamid and W. L. Gore), who have always been available for advice and counsel. I am most thankful to past colleagues at Unilever, Lou Piombino, Maria Ruibal, and Dirk Lueders, who over the years served as a sounding board for my ideas. I am particular indebted to Randy Mosebrook of Sun Products Company, who provided helpful advice and support on this project. In the area of Lean and TPM I am most grateful to Shinichi Shinotsuka, who served

as my TPM/Lean instructor and sensei, and also to my fellow Unilever TPM instructors, Edna DeFlavis, Cindy Rigby, and Mike Johnston, who spent long weeks away from home leading instructors' courses and living and breathing the Lean life. To paraphrase Bernard of Chartres and Sir Isaac Newton, if you find my work enlightening it is only because "like a dwarf it is only by standing on the shoulders of giants that I have been able to see farther."

Thanks to my publisher, Taylor & Francis Group/Productivity Press, for its belief in this project and willingness to back a young author. Finally, a hug and heartfelt thanks to my wife, Joan, and my children, Brian and Caitlin, for their support and understanding while I endeavored to write this book. Many evenings and weekends they were left to fend on their own while I hunkered down in the college library. Their words of encouragement were the fuel that kept me going and the laptop humming.

About the Author

Dennis Averill CIH, CSP has over 25 years of management experience in the chemical, food, and consumer products industries, leading corporate programs in the areas of safety, health & environment (SHE), quality, and manufacturing improvement (Lean & TPM).

Mr. Averill was a Phi Beta Kappa, Bachelor of Science graduate of the University of Richmond.

He has also earned a Master of Health Science degree in environmental health engineering, and a Master of Administrative Science degree in business management from the Johns Hopkins University where he has served as an associate of the Johns Hopkins Bloomberg School of Public Health. He is a Certified Industrial Hygienist (CIH), a Certified Safety Professional (CSP), and a Certified TPM Instructor.

He has lent his time and talents to various professional and community groups serving as president of the American Industrial Hygiene Association, Chesapeake Section; vice president of the Community Coalition of Harford County; member of the Harford County Emergency Planning Committee; industry representative on the Maryland Governor's Council on Toxic Substances; and member of the American Society of Safety Engineers Management Specialty Practice Group.

Chapter 1

Safety, Health, and Environmental (SHE) Pillar: Foundation of Lean Continuous Improvement

Safe upon solid rock the ugly houses stand.

Edna St. Vincent Millay
American poet 1842–1950

1.1 Beginnings of Lean and TPM

Lean production is an improvement model and collection of tools that emphasizes the elimination of all types of waste (*muda*) and non-value-added activities, and the delivery of high-quality products at the lowest possible cost. The focus of Lean is on producing more goods with fewer resources by driving continual improvement in all areas of business performance, including cost, productivity, efficiency, and safety, health, and environment (SHE). Key principles of a Lean supply chain include

1. Value is defined by the customer.
2. The supply chain and value stream should flow continuously.
3. The entire organization must manage toward perfection by eliminating waste and adding value.^{1,2}

It is important to note that from a Lean perspective, workplace accidents and environmental incidents are wastes that harm the value stream, hamper continuous flow, and work against the goal of perfection. Therefore, when implemented properly, Lean production is consistent with, and supportive of, SHE excellence.

To fully appreciate the impact of Lean thinking and practice on modern manufacturing and its relationship to achieving SHE excellence, it is helpful to have an understanding of its history, roots, and philosophy. Although the modern Lean methodology is derived from the Toyota Production System (TPS), its history and evolution can be traced back almost 100 years. American industrialist Henry Ford is commonly recognized as the first person to move away from craft production and use the assembly line to achieve production flow and mass production. In 1913 at his Model T automobile manufacturing complex in Highland Park, Michigan, Ford integrated the concepts of interchangeable parts, standard work, and production flow via the moving assembly line. Although Ford's mass production process successfully produced over 15 million Model T autos at low cost, his system had some marked deficiencies. Specifically, Ford's production process was inflexible and unable to provide product variety. As Ford wrote in his autobiography, "Any customer can have a car painted any colour that he wants so long as it is black."³ Ford's mass production approach "only worked when production volumes were high enough to justify high-speed assembly lines, when every product used exactly the same parts, and when the same model was produced for many years."⁴ Although Ford was a pioneer in advancing better pay for workers, Ford's system also suffered from the fact that it tended to devalue workers, assigning them to repetitive tasks, not tapping their full capabilities, and not seeking their input. To a large extent, labor was viewed solely as a cost of production, and not something that could add value. Workers on the production line were replaceable and expendable. Although the mass assembly line resulted in marked production improvements and some improvements in safety, working conditions were far from ideal.⁵

The Ford Motor Company's mass production model played a pivotal role in the Allied victory during World War II. The ability of American industry to produce the massive quantity of war materiel that ensured victory did not go unnoticed by Japanese industrialists. At the Toyota Company, Eiji Toyoda, Shigeo Shingo, and Taiichi Ohno studied Ford's production system, American grocery chains, and the statistical process control methods of W. Edwards Deming, Kaoru Ishikawa, and Joseph Juran. Around 1950, based upon these studies of American production methods, Toyota's chief engineer, Taiichi

Ohno, developed the Toyota Production System. The main objectives of the Toyota system are to eliminate waste (*muda*), stress (*muri*), and inconsistency (*mura*) by creating a smooth, flexible, accident-free, and efficient production system. Through key approaches such as just-in-time (JIT), error-proofing (*poka-yoke*), autonomation (*jodoka*), standardized work, and continuous improvement (*kaizen*); waste, stress, accidents, and inconsistency are eliminated and efficient, safe, high-quality, low-cost production is achieved. The Toyota Production System and modern Lean production both value factory workers for their muscle and their brains, and tap into employee creativity and ingenuity by involving everyone in continual improvement activities. According to Toyota, to function well, a factory must optimize both its equipment and its people. “The power behind TPS is a company’s management commitment to continuously invest in its people and promote a culture of continuous improvement.”⁶ Toyota’s approach to manufacturing, termed the Toyota Way, is summarized in its four high-level principles:

1. Go and See for Yourself (*genchi genbutsu*)
2. Continuous Improvement (*kaizen*)
3. Respect and Teamwork
4. Challenge

Consistent with the principle of respect and teamwork, the Toyota Production System emphasizes workplace safety, health, and environment. Organizations using TPS typically measure their progress by using the acronym QCDSM to focus on key performance indicators in the areas of quality, cost, delivery, safety, and morale. SHE excellence is consistent with the TPS goal of creating an efficient, stress-free work environment.⁷ In an internal Toyota communication, Taiichi Ohno expressed the organization’s uncompromising commitment to safety excellence: “Every method available for man-hour reduction to reduce cost must, of course, be pursued vigorously; but we must never forget that safety is the foundation of all our activities. There are times when improvement activities do not proceed in the name of safety. In such instances, return to the starting point and take another look at the purpose of that operation.”⁸

1.2 James Womack and Lean

James Womack and fellow MIT researcher John Krafcif are credited with coining the term “Lean production.” During the mid- and late 1980s, James Womack and other researchers at MIT’s International Motor Vehicle Program

studied the manufacturing systems of global auto manufacturers. They concluded that the auto industries of North America continued to rely upon outdated mass production systems, whereas Japanese companies were employing a new technique that they termed “Lean production” because it used significantly fewer resources than mass production. According to Womack, “Lean production combines the advantages of craft and mass production.... Lean producers employ teams of multiskilled workers at all levels of the organization and use highly flexible, increasingly automated machines to produce volumes of products in enormous variety.”⁹ Lean organizations are focused on perfection and committed to continuous improvement. The goals are continually declining costs, zero defects, zero losses, and zero accidents. Womack argued that a fundamental shift in global manufacturing methods had taken place, characterized by the decline of mass production and the dawning of a new age of Lean production. Unlike mass production, Lean production valued workers for more than their brawn. Workers were grouped in teams and were expected to take ownership of equipment and to assume responsibility for all operations in their work area including housekeeping, minor repairs, quality production, safety, and process improvement.¹⁰

1.3 TPM

In the 1970s a management improvement methodology known as total productive maintenance was developed by the Japanese based upon American preventive maintenance or PM concepts. In 1971 the Nippondenso Co., Ltd., a manufacturer of automobile parts for Toyota, received the PM award for its total-member-participation PM program or TPM process. With the assistance of the Japan Institute of Plant Maintenance (JIPM), the Nippondenso/Toyota process gradually evolved into the current total productive maintenance or TPM methodology. The following key characteristics of the TPM methodology reveal its close relationship to Lean production:

1. The pursuit of overall organizational efficiency via the persistent elimination of all losses
2. Ownership of equipment, processes, and associated losses by operators
3. Implementation of continuous improvement via overlapping small group activities
4. A hands-on approach to build a zero accident, zero defect, zero loss system throughout the organization

Originally the Japanese TPM methodology consisted of five areas of focus, or pillars: focused improvement (FI or *Kobetsu Kaizen*), autonomous maintenance (AM or *Jishu Hozen*), planned maintenance (PM or *Keikaku Hozen*), training and education (TE), and early management (EM). TPM's initial focus on production activities and associated losses, although beneficial, was incomplete. It became clear that a process that did not consider quality, management, or safety, health, and environmental losses could not sustain true continuous improvement. Therefore, as indicated in Figure 1.1, three additional pillars were added to the TPM process: quality maintenance (QM or *Hinshitsu Hozen*), TPM in administration (the office), and safety, health, and environment (SHE). Today the eight pillars of TPM are commonly applied companywide in both production and nonproduction areas such as engineering, administration, development, and distribution. In light of this, some organizations have indicated the expanded scope of their continuous improvement process by changing the meaning of the TPM acronym from "Total Productive Maintenance" to the more expansive "Total Productive Manufacturing" or "Total Perfect Manufacturing."¹¹

Today, the Japan Institute of Plant Maintenance (JIPM) requires organizations to reduce accidents and environmental pollution in order to receive its TPM Excellence Award, also known as the PM Prize. Safety, health, and

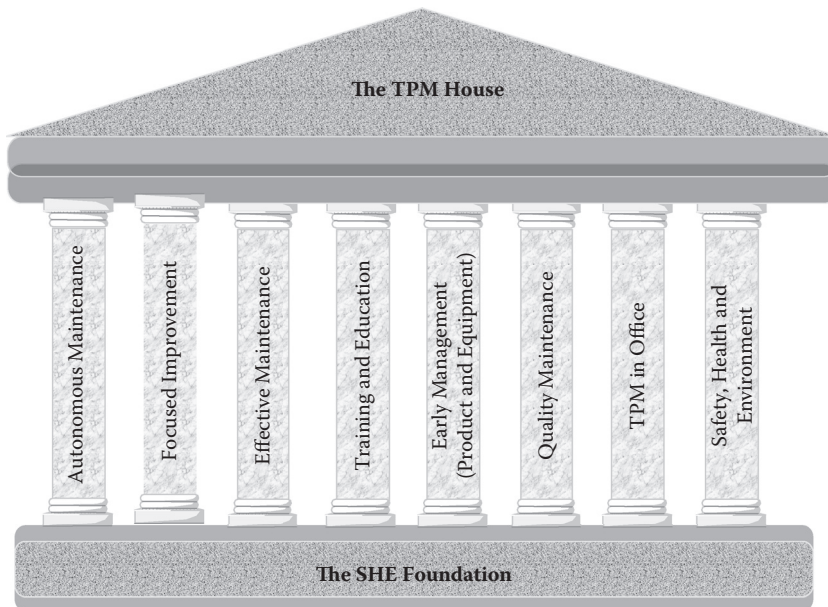


Figure 1.1 The pillars of TPM.