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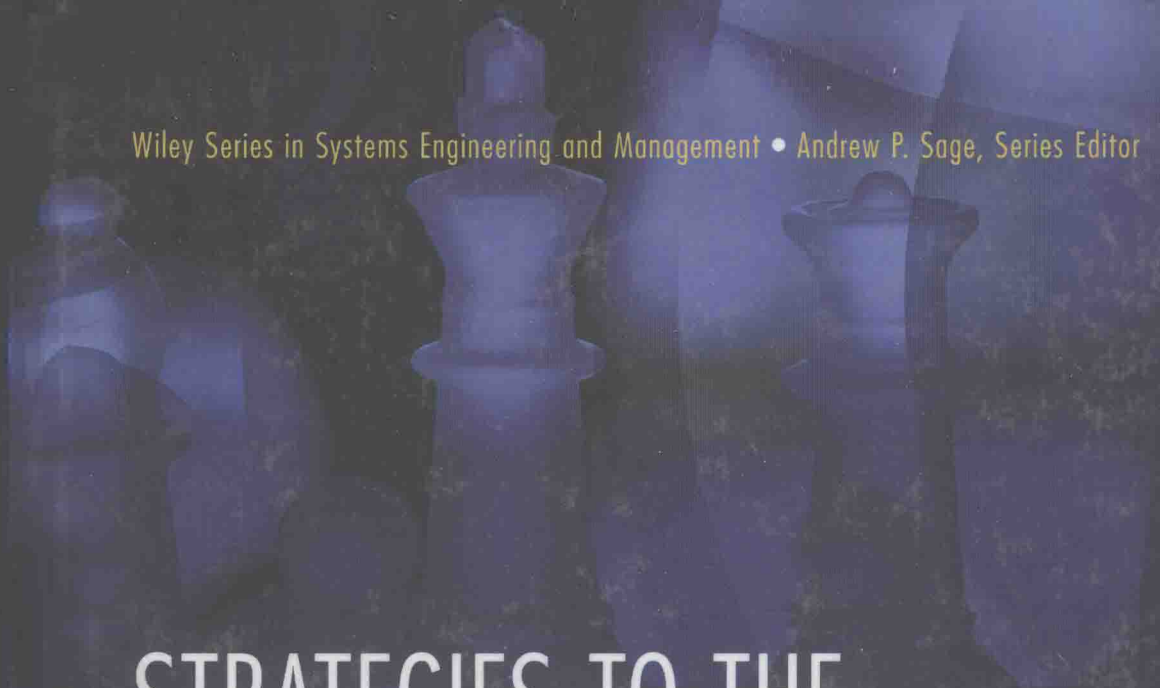

STRATEGIES TO THE PREDICTION, MITIGATION, AND MANAGEMENT OF PRODUCT OBSOLESCENCE

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Preface

Engineers and managers must be aware of the life cycles of the parts they incorporate into their systems. Otherwise, they can end up with a product whose parts are not available or a product that cannot perform as intended, cannot be assembled, and cannot be maintained without high life cycle costs. While technological advances continue to meet product development needs, engineering decisions regarding when and how a new part will be used and the associated risks differentiate the winners and losers.

This book will enable manufacturers and supporters of products and systems to manage the obsolescence of the parts that compose their products and systems. This book is intended for engineers and managers, product team members, marketing professionals, business development professionals, and contract negotiators.

This book explains the life cycle of parts and software and presents a process for obsolescence forecasting based on sales data, case studies illustrating forecasting methods, and explanations of reactive, proactive, and strategic obsolescence management strategies.

Chapter 1 describes general definitions and the fundamental issues associated with the occurrence of obsolescence and its management. This chapter builds the foundation for obsolescence management to reduce the risks affecting various products and industries.

Chapter 2 describes the change management methods and controls commonly used by semiconductor manufacturers and the types of changes that they make. Relevant standards and guidelines are introduced and described. Some of the major change management standards development bodies are discussed and examples are given.

Chapter 3 describes the electronic part life cycle from design and introduction to obsolescence. The six stages of an electronic part life cycle are explained and described in terms of attributes such as sales, price, usage, part modification, number of competitors, and profit margin.

Chapter 4 explains several methodologies for forecasting obsolescence. Methodologies based on sales curve forecasting and procurement life analysis are included.

Chapter 5 illustrates the application of the obsolescence forecasting methodology in the form of case studies for different part types. For each of these part types, information on the part type, market trends, procurement life cycle of the part type, and zone of obsolescence are presented.

Chapter 6 discusses software obsolescence. Obsolescence management is not just a hardware problem; it is a hardware and software problem. Hardware changes drive software obsolescence and vice versa.

Chapter 7 explains reactive strategies that can be employed by equipment manufacturers to combat the problem of obsolescence. Reactive obsolescence management is concerned with determining an appropriate, immediate resolution to the problem of components becoming obsolete. This chapter also provides a guide to select an appropriate reactive obsolescence management strategy.

Chapter 8 illustrates strategies to proactively manage obsolescence and track procurement life cycle information on selected parts to prevent obsolescence-driven risks such as production stops and expensive redesigns.

Chapter 9 explains strategic obsolescence management to enable strategic planning, life cycle optimization, and long-term business case development for the support of systems by using obsolescence data, logistics management inputs, technology forecasting, and business trending. This chapter also provides a guide for implementing strategic obsolescence management within an organization.

Chapter 10 describes relevant standards and guidelines for the management of obsolescence. Some of the major change management standards development bodies and organizations are discussed and examples are given.

Finally, an extensive list of references is provided to aid the reader in finding additional information.

Contents

Chapter 1

Introduction to Obsolescence Problems

Obsolescence is the status given to a part when it is no longer available from its original manufacturer. The original manufacturer's discontinuance of a part may have many causes, including nonavailability of the materials needed to manufacture the part, decreased demand for the part, duplication of product lines when companies merge, or liability concerns. The problem of obsolescence is most prevalent for electronics technology, wherein the procurement lifetimes for microelectronic parts are often significantly shorter than the manufacturing and support life cycles for the products that use the parts. However, obsolescence extends beyond electronic parts to other items, such as materials, textiles, and mechanical parts. In addition, obsolescence has been shown to appear for software, specifications, standards, processes, and soft resources, such as human skills.

This chapter describes general definitions and the fundamental issues associated with the occurrence of obsolescence and its management in order to build a consistent basis for this topic. Because obsolescence is most prevalent for electronics, this chapter concentrates on the issues associated with obsolescence in relation to electronic parts; however, most of what follows is also applicable for nonelectronic parts as well.

1.1 DEFINITION OF OBSOLESCENCE

The English word *obsolescence* is derived from the Latin term *obsolescere*, which means "to go out of use or fashion." The associated adjective *obsolescent*

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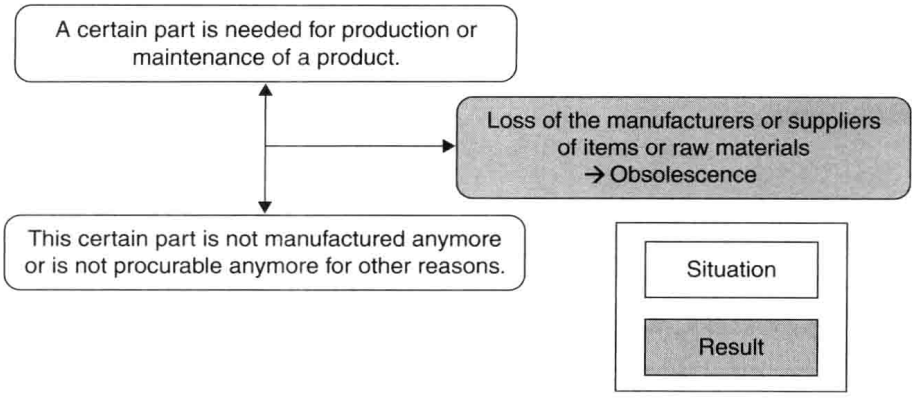

FIGURE 1-1 Appearance of obsolescence.

is derived from the Latin term *obsoletus*, meaning "worn out" (Baer and Wermke, 2000).

Obsolescence, as addressed in this book, refers to materials, parts, devices, software, services, and processes that become non-procurable from their original manufacturer or supplier. As parts become obsolete, users and customers are inevitably faced with a supply shortfall when their demands for the original part cannot be satisfied and no alternate parts are procurable (Atterbury, 2005; Rogokowski, 2007).

Generally, obsolescence is defined as the loss, or impending loss, of the manufacturers or suppliers of items or raw materials, as shown in Figure 1-1 (Tomczykowski, 2001).[1] However, a more realistic working definition of obsolescence is when a part (material or technology) that is needed to manufacture or support a product or system is not available from existing stock or the original manufacturer of the part (material or technology).

There are many possible reasons for obsolescence. Some of the causes of obsolescence include the following:

- Rapid technological development makes a product or part unusable for technical, economical, or legal reasons (Feldmann and Sandborn, 2007)
- The original component manufacturer (OCM) or original equipment manufacturer (OEM) disappears from the market for various reasons (Atterbury, 2005)

[1]This definition of obsolescence is sometimes called "procurement" or "DMSMS-type" obsolescence, where DMSMS stands for Diminishing Manufacturing Sources and Material Shortages. Note: Other definitions of obsolescence that are not relevant to the topic of this book include "sudden" or "inventory" obsolescence, which refers to the obsolescence of an inventory of parts that remain after the demand for the part disappears (Brown et al., 1964). Sudden obsolescence is the opposite of the problem addressed in this book.

- The OCM or OEM is not willing to continue producing a part for economic reasons (usually precipitated by a drop in demand for the part) (Atterbury, 2005)
- Chemical or physical aging processes of parts placed in storage can destroy parts or make it impossible to use existing part inventories in products

Terms such as *obsolescence* and *obsolete* are already used by some companies when they provide a product change notification (PCN) or end-of-life (EOL) notice. In such cases, the part is sometimes still procurable for a limited time; that is, customers may have the opportunity to buy parts one last time and store enough of them to meet their systems' forecasted lifetime requirements. These actions are referred to as life-of-type (LOT) buys, lifetime (last time) buys (LTBs), or bridge buys (see Chapter 7).

1.2 CATEGORIZATION OF OBSOLESCENCE TYPES

The subject of this book is involuntary obsolescence, where neither the customer nor the manufacturer necessarily wants to change the product or the system. Involuntary obsolescence can be categorized as follows (Feldmann and Sandborn, 2007; Rai and Terpenny, 2008):

- *Logistical* Loss of the ability to procure the parts, materials, manufacturing, or software necessary to manufacture and/or support a product.
- *Functional* The product or subsystem still operates as intended and can still be manufactured and supported, but the specific requirements for the product have changed; as a result the product's current function, performance, or reliability (level of qualification) become obsolete. For consumer products, functional obsolescence is the customer's problem; for more complex systems (such as avionics) it is both the manufacturer's and customer's problem. For complex systems, the functional obsolescence of a subsystem is often caused by changes made to other portions of the system.
- *Technological* More technologically advanced components have become available. This may mean that inventory still exists or can be obtained for older parts that are used to manufacture and support the product, but it becomes a technological obsolescence problem when suppliers of older parts no longer support them.
- *Functionality Improvement Dominated Obsolescence (FIDO)* Manufacturers cannot maintain market share unless they evolve their products in order to keep up with competition and customer expectations (manufacturers are forced to change their products by the market). Note that this differs from functional obsolescence in that for commercial products FIDO obsolescence is forced upon the manufacturers and functional obsolescence is forced upon the customers.

1.3 DEFINITION OF OBSOLESCENCE MANAGEMENT

To ensure a constant qualitative performance, an obsolescence management plan should be improved continually. For example, the Plan-Do-Check-Act (PDCA) cycle shown in Figure 1-2 is an appropriate way to satisfy this goal. Developed by Dr. W. Edwards Deming, the PDCA cycle is also called the Deming Cycle or Deming Wheel (Seghezzi, 1996).

To support continuous improvement, obsolescence management organizations must be provided with adequate resources to support necessary activities that are consistent with the organization's business. The company management (for example, the chief executive officer) is responsible for providing these resources and for establishing an obsolescence management plan within the framework of a dependability management system (IEC-62402, 2004).

The management of obsolescence problems is often referred to as "diminishing manufacturing sources and material shortages" (DMSMS) (Saunders, 2006). As addressed in this book, DMSMS specifically refers to the loss of the ability to procure required materials, parts, or technology.

The process for managing obsolescence is illustrated in Figure 1-3 to mitigate or avoid the impact of supply shortfalls for all types of materials, parts, devices, software, services, and processes during the intended life of a product.

Obsolescence management implies life cycle forecasting and other analyses to identify the effects of obsolescence through all stages of the product life cycle. The cost avoidance associated with various management actions must be

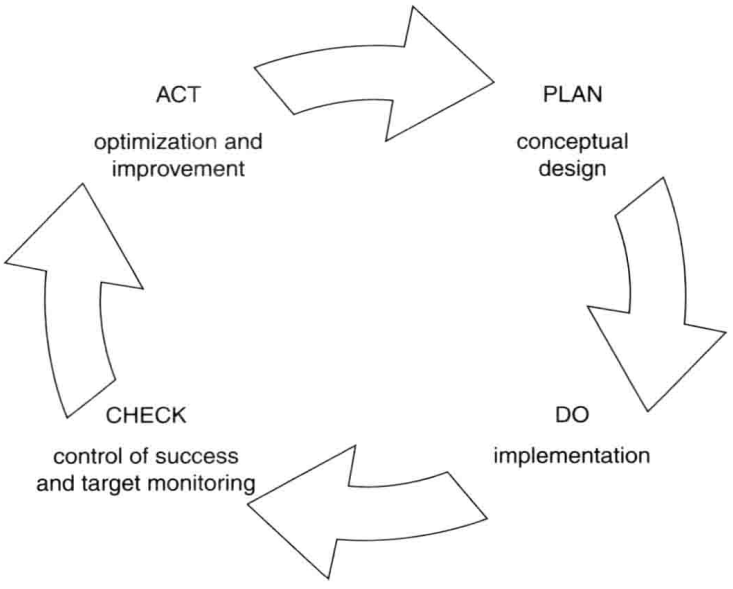

FIGURE 1-2 PDCA cycle.