CHAPTER 1

INTRODUCTION: WHY HAVE A WAREHOUSE?

WITH SO MANY ATTEMPTS to eliminate inventory and warehousing in the supply chain, why should you read a book on warehousing?

1.1 SUPPLY CHAIN IMBALANCES

Despite all of the initiatives in e-commerce, supply chain integration, efficient consumer response, quick response, and just-in-time delivery, the supply chain connecting manufacturing with end consumers will never be so well coordinated that warehousing will be completely eliminated. However, as these initiatives take hold, the role and mission of warehouse operations are changing and will continue to change dramatically. This book holds up flexibility as the key to success in warehousing and describes how to increase the flexibility of warehouse operations through process design, system selection and justification, and layout configuration.

1.2 HIGH-SPEED, ZERO DEFECT SUPPLY CHAINS

Supply chain integration initiatives to minimize pipeline inventory severely reduce the margin for error in supply chain logistics. Hence, the accuracy and cycle time performance pressures in warehousing are immense. This books defines world-class accuracy and cycle time performance goals and

defines the world-class processes that yield world-class accuracy and cycle time.

1.3 VALUE-ADDED WAREHOUSING

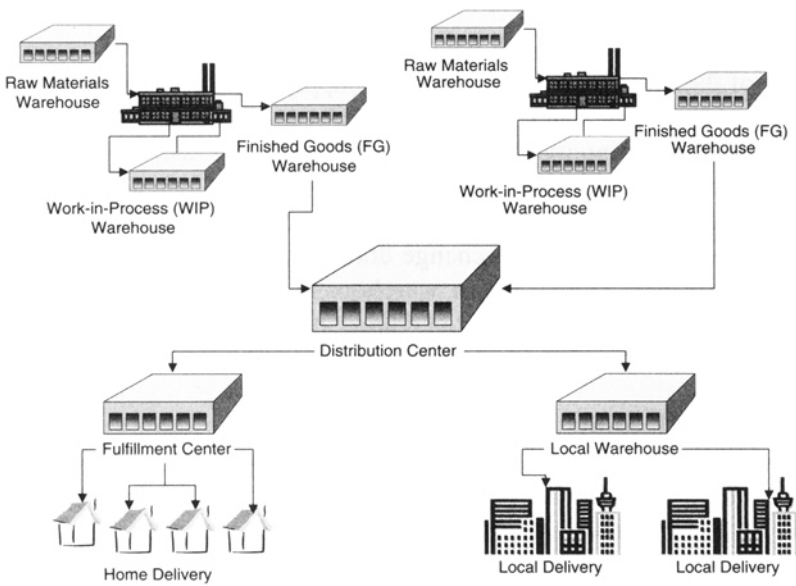
Warehouses play vital roles in the supply chain (see Figure 1-1).

Raw material and component warehouses Hold raw materials at or near the point of induction into a manufacturing or assembly process.

Work-in-process warehouses Hold partially completed assemblies and products at various points along an assembly or production line.

Finished goods warehouses Hold inventory used to balance and *buffer* the variation between production schedules and demand. For this purpose, the warehouse is usually located near the point of manufacture and is often characterized by the flow of full pallets in and full pallets out, assuming that product size and volume warrant pallet-sized loads. A warehouse serving only this function may have demands ranging from monthly to quarterly replenishment of stock to the next level of distribution.

FIGURE 1-1 The roles of a warehouse in logistics and supply chain management.



Distribution warehouses and distribution centers Accumulate and consolidate products from various points of manufacture within a single firm, or from several firms, for combined shipment to common customers. Such a warehouse may be located central to either the production locations or the customer base. Product movement may be typified by full pallets or cases in and full cases or broken case quantities out. The facility is typically responding to regular weekly or monthly orders.

Fulfillment warehouses and fulfillment centers Receive, pick, and ship small orders for individual consumers.

Local warehouses Distributed in the field in order to shorten transportation distances to permit *rapid response* to customer demand. Frequently, single items are picked, and the same item may be shipped to the customer every day.

Value-added service warehouses Serve as the facility where key product customization activities are executed, including packaging, labeling, marking, pricing, and returns processing.

This book describes the processes and systems required for the warehouse to satisfy each of these mission statements.

Figure 1-1 illustrates warehouses performing these functions in a logistics network. Unfortunately, in many of today's networks, a single item will pass in and out of warehouses serving each of these functions between the point of manufacture and the customer. When feasible, two or more missions should be combined in the same warehousing operation, and handling steps in the chain should be minimized. Current changes in the availability and cost of transportation options make combining activities in a single location and link skipping possible for many products. In particular, small high-value items with unpredictable demand are frequently shipped worldwide from a single source using overnight delivery services.

1.4 RISING WAREHOUSING COSTS

Warehousing is expensive—making up between 2 and 5 percent of the cost of sales of a corporation. With renewed corporate emphasis on return-on-assets, minimizing the cost of warehousing has become an important business issue. At the same time, continued emphasis on customer service places most warehouse managers between a rock and a hard place—looking for ways to trim costs and improve customer service at the same time. This book is written with this challenge in mind and provides a variety of process

improvement suggestions aimed at improving warehouse resource utilization while maintaining and/or improving customer service.

1.5 CONFUSION AND CROWDING IN THE WAREHOUSE MARKETPLACE

The warehousing marketplace is confused and crowded with hundreds of suppliers of warehouse management systems, hundreds of third-party warehousers, and hundreds of warehousing consultants. This book was written to make you a better consumer in the marketplace, equipping you to separate the wheat from the tares.

1.6 THE PLIGHT OF THE WAREHOUSE MANAGER

Under the influence of e-commerce, supply chain collaboration, globalization, quick response, and just-in-time, warehouses today are being asked to

- Execute *more*, smaller transactions
- Handle and store *more* items
- Provide *more* product and service customization
- Offer *more* value-added services
- Process *more* returns
- Receive and ship *more* international orders

At the same time, warehouses today have

- *Less* time to process an order
- *Less* margin for error
- *Less* young, skilled, English-speaking personnel
- *Less* WMS capability (a byproduct of Y2K investments in ERP systems)

I call this "rock and a hard place" scenario the plight of the warehouse manager. Never has the warehouse been asked to do so much and at the same time been so strapped for resources.

1.7 LOGISTICS LITIGATION

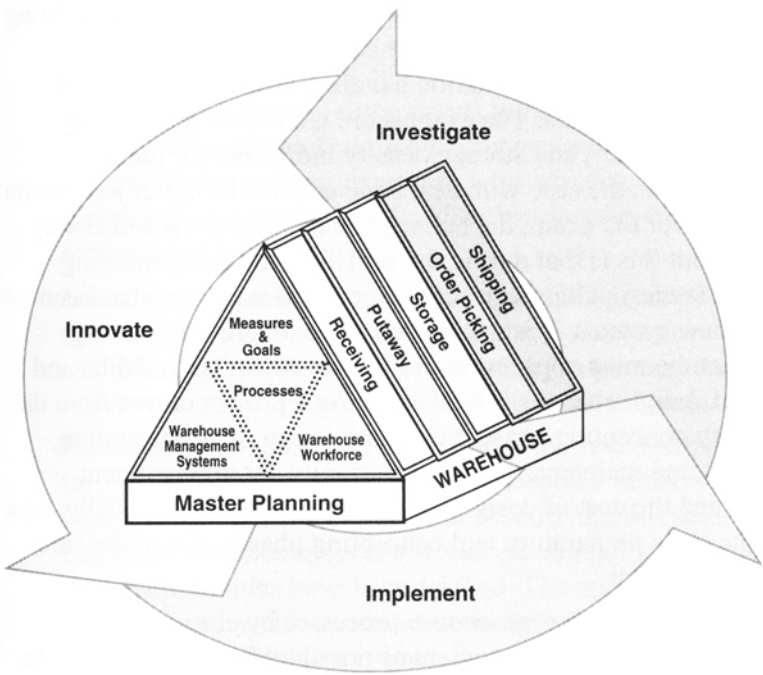
One barometer we have for the focus of business on the warehouse is the number of requests for expert witness work we receive. In the last year, we have had an unprecedented number of requests for expert witness work related to failed warehouse management or material handling systems. The fault is about evenly divided between vendors and users; however, the num-

ber of calls is a testimony to the value that corporations are placing on warehouse operations. Never before has it been so critical for the warehouse to work efficiently, quickly, and error free.

The bottom line is that the warehouse is playing a more vital role in the success (or failure) of businesses today than it ever has. This book describes the principles of warehousing that yield world-class warehousing operations. The principles follow our warehouse master planning methodology (see Figure 1-2) and cover the following:

- Investigating warehouse operations (Section I) through warehouse activity profiling (Chapter 2) and warehouse performance benchmarking (Chapter 3)
- Innovating, optimizing, and simplifying warehouse operations (Section II) in receiving and put-away (Chapter 4), storage (Chapters 5-7), order picking (Chapter 8), shipping (Chapter 9), and material flow (Chapter 10)

FIGURE 1-2 Warehouse master planning methodology.



- Implementing new warehousing designs (Section III) in computerizing warehouse operations (Chapter 11), and humanizing warehouse operations (Chapter 12)

World-Class Warehousing presents an organized set of principles that separate world-class warehouse operations from middle- and no-class warehouse operations. The principles were developed during a retrospective review of hundreds of warehousing projects, including greenfield warehouse designs, warehouse layout designs, warehouse operations benchmarking, warehouse process improvement, and warehouse management systems design and implementation. These principles are the *common denominators* of the successful projects and successful warehouse operations. In order, they are

1. **Profile** Create and maintain order profiles, item activity profiles, and planning profiles to identify root causes of process impediments and breakthrough opportunities for improvement.
2. **Benchmark** Benchmark warehouse performance, practices, and operating infrastructure against world-class standards to determine performance, practice, and infrastructure gaps, to quantify opportunities for improvement, and to estimate the affordable investment in new material and information handling systems.

   Profiling (Chapter 2) and benchmarking (Chapter 3) amount to doing your homework before an exam. In this case, the exam is process redesign, material and information handling systems design, and systems implementation. The exam score is the new productivity, cycle time, accuracy, and storage density indicators for the warehouse. As is the case with academic exams, the better job you do in preparing for the exam, the better your exam score. Another way to think about this is that during the profiling and benchmarking process, no redesign has been set in stone, and no money has been spent on new systems. It is during this stage of a re-engineering project that the most opportunity for improvement is available, and the cost of design changes is the lowest. As a project moves from the preliminary concepting phase into detail design, implementation, debugging, and maintenance, the opportunity for improvement degrades and the cost of design changes increases exponentially. As a result, the early preparatory and concepting phases of a project are the most important.
3. **Innovate** Reconfigure warehouse processes by eliminating and streamlining as much work content as possible. Because most of the

work in a warehouse is material and information handling, these two activities should be the focus of the process redesign initiatives.

Innovation (Chapters 4–10) follows profiling and benchmarking because the project team needs the warehouse activity profile to creatively generate new, minimum work content processes and needs the benchmarking results to know the performance goals of the new processes and to know how much capital is available for new systems.

4. **Automate** To automate means to *computerize* and to *mechanize*. *Computerizing* is to incrementally justify and incrementally implement warehouse management systems, paperless warehousing systems, and decision support tools to maintain the warehouse activity profile, to track warehouse performance and resource utilization, and to enforce simplified warehouse processes. *Mechanizing* is to incrementally justify and incrementally implement mechanized material handling and storage systems to improve warehouse throughput and storage density and to assist warehouse operators in difficult material handling activities.

   Computerizing (Chapter 11) follows innovation because the primary role of the computer is to enforce and monitor the new, simple processes. The warehouse management systems and paperless warehousing system requirements should flow naturally from the process definitions developed during simplification.

   Mechanization (taught throughout) follows computerizing because the simplification and computerizing process should minimize the amount of mechanization required. Investments in mechanized systems are inherently less flexible than investments in computer software and hardware.

5. **Humanize** Humanize warehouse operations by involving warehouse operators in redesigning warehouse processes, by developing team and individual performance goals, and by implementing ergonomic improvements in every manual activity in the warehouse.

   Humanizing (Chapter 12) is the last of the seven steps, not because the operators are the least important resource in the warehouse (in fact, just the opposite is true), but because the full skill set and cultural requirements for the workforce are not known until each of the first principles have been applied. The only advice I can give in this area is very old advice—treat people the way you would like to be treated. It works every time.

Applied in this order, these principles can and have been used to create warehousing master plans, to reengineer warehousing operations, to guide warehouse process improvement projects, and to develop requirements for warehouse management systems. I hope you will find them useful in similar projects.

If you are already familiar with the field of warehousing, please move onto the first step: profiling. If you are new to the field, the following review of warehousing basics may be helpful.

1.8 WAREHOUSING FUNDAMENTALS

Though warehousing is increasing in importance in logistics and supply chain management, it is still integrated with and to a large degree dependent on other logistics activities. In fact, in our teaching and consulting, we present warehousing as the last of the five logistics activities (see Figure 1-3) for a variety of reasons. First, good planning in the other four areas of logistics may eliminate the need for warehousing. Second, requirements in the other four areas of logistics may suggest that a third-party warehousing firm should be retained to operate the warehouse. Third, the warehouse must be designed to meet all the requirements of the customer service policy spelled out in the customer response master plan, house all the inventory required by the inventory master plan, work to receive in quantities stipulated by the supply master plan, and serve a mission stipulated by the transportation master plan. The warehouse is a service to all the other areas of logistics.

Despite the name or role, warehouse operations have a fundamental set of activities in common. The following list includes the activities found in most warehouses. These tasks, or functions, are also indicated on a flow line in Figure 1-4 to make it easier to visualize them in actual operation.

1. Receiving
2. Prepackaging (optional)
3. Putaway
4. Storage
5. Order picking
6. Packaging and/or pricing (optional)
7. Sortation and/or accumulation
8. Unitizing and shipping

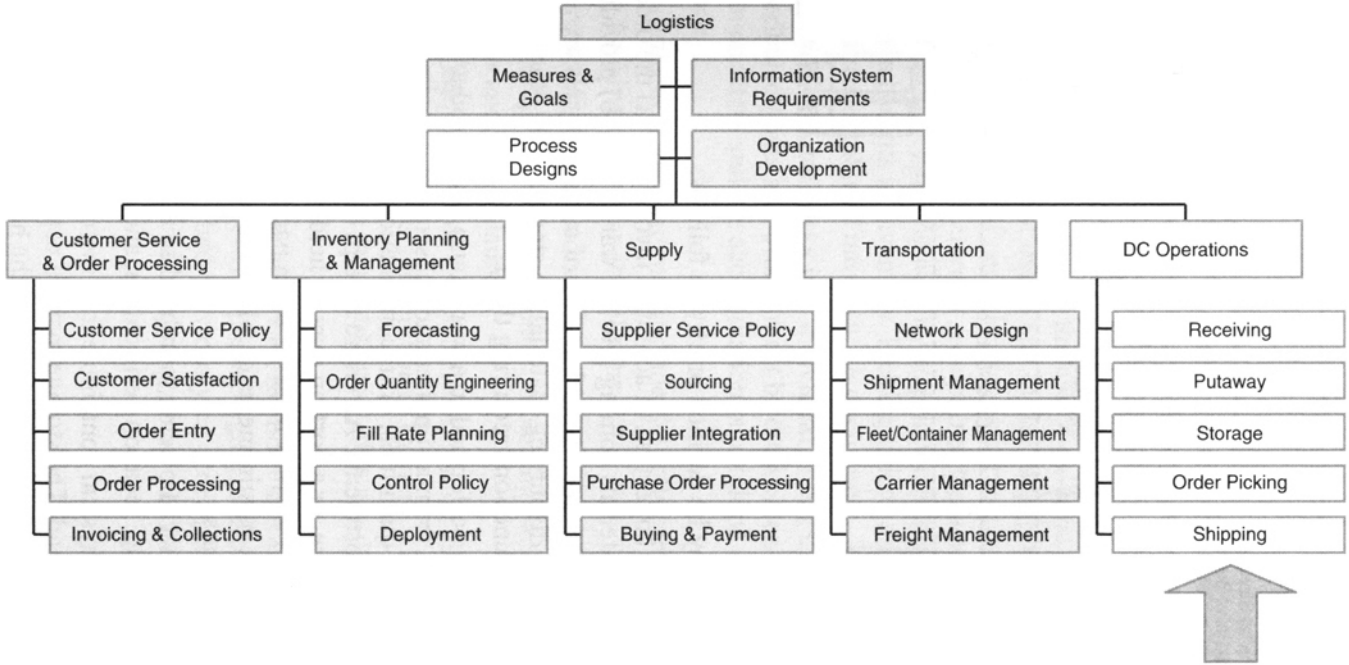
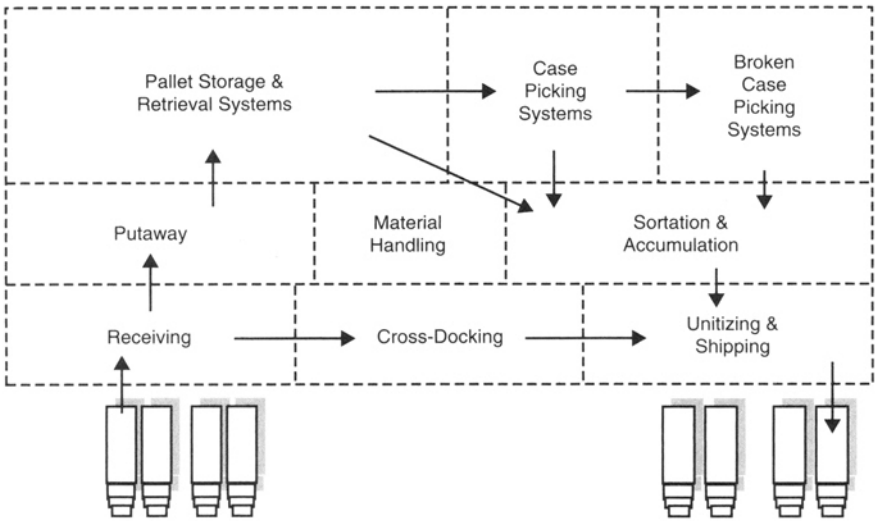


FIGURE 1-3 Warehousing in the logistics framework.

FIGURE 1-4 Common warehouse activities.



The functions may be defined briefly as follows:

1. *Receiving* is the collection of activities involved in (a) the orderly receipt of all materials coming into the warehouse, (b) providing the assurance that the quantity and quality of such materials are as ordered, and (c) disbursing materials to storage or to other organizational functions requiring them.
2. *Prepackaging* is performed in a warehouse when products are received in bulk from a supplier and subsequently packaged singly, in merchandisable quantities, or in combinations with other parts to form kits or assortments. An entire receipt of merchandise may be processed at once, or a portion may be held in bulk form to be processed later. This may be done when packaging greatly increases the storage-cube requirements or when a part is common to several kits or assortments.
3. *Putaway* is the act of placing merchandise in storage. It includes material handling, location verification, and product placement.
4. *Storage* is the physical containment of merchandise while it is awaiting a demand. The storage method depends on the size and quantity of the items in inventory and the handling characteristics of the product or its container.

5. *Order picking* is the process of removing items from storage to meet a specific demand. It is the basic service a warehouse provides for customers and is the function around which most warehouse designs are based.
6. *Packaging* and/or *pricing* may be done as an optional step after the picking process. As in the prepackaging function, individual items or assortments are containerized for more convenient use. Waiting until after picking to perform these functions has the advantage of providing more flexibility in the use of on-hand inventory. Individual items are available for use in any of the packaging configurations right up to the time of need. Pricing is current at the time of sale. Prepricing at manufacture or receipt into the warehouse inevitably leads to some repricing activity as price lists are changed while merchandise sits in inventory. Picking tickets and price stickers are sometimes combined into a single document.
7. *Sortation* of batch picks into individual orders and *accumulation* of distributed picks into orders must be done when an order has more than one item and the accumulation is not done as the picks are made.
8. *Unitizing* and *shipping* may include the following tasks:
   - Checking orders for completeness
   - Packaging merchandise in appropriate shipping containers
   - Preparing shipping documents, including packing lists, address labels and bills of lading
   - Weighing shipments to determine shipping charges
   - Accumulating orders by outbound carrier
   - Loading trucks (in many instances, this is a carrier's responsibility)

For discussion purposes, this book includes in *receiving* those activities described previously as receiving, prepackaging, and putaway; in *order picking*, those activities described previously as order picking, packaging, and sortation/accumulation; and in *shipping*, those activities described as unitizing and shipping.