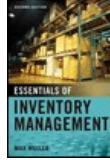


# Chapters *To Go*



## Essentials of Inventory Management, Second Edition

by Max Muller  
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## Chapter 1: Inventory as Both a Tangible and an Intangible Object

The objective of this chapter is to provide you with a basic understanding of the nature of inventory as both a tangible, physical item actually kept within the facility (“real life” or “shelf count”) and as an intangible item existing within the company’s records (“paper life” or “record count”). Since you frequently make purchasing, sales, customer service, production planning, and other decisions based on whether an item is shown as being in-house as *per your records*, an item’s paper life can be just as important as its real life.

### Inventory—Who Needs It?

All organizations keep inventory. “Inventory” includes a company’s raw materials, work in process, supplies used in operations, and finished goods.

Inventory can be as simple as a bottle of glass cleaner used as part of a building’s custodial program or as complex as a mix of raw materials and subassemblies used as part of a manufacturing process.

### Inventory Costs

Inventory brings with it a number of costs, including:

- Dollars
- Space
- Labor to receive, check quality, put away, retrieve, select, pack, ship, and account for the item(s)
- Deterioration, damage, and obsolescence
- Theft

Inventory costs generally fall into ordering costs and holding costs. Ordering, or acquisition, costs come about regardless of the actual value of the goods. These costs include the salaries of those purchasing the product, costs of expediting the inventory, and so on. For a complete discussion of ordering costs, see Chapter 5, Planning and Replenishment Concepts. For a complete discussion of carrying costs, see Chapter 2, Inventory as Money.

As discussed in Chapter 2, holding costs include the cost of capital tied up in inventory (the opportunity cost of money<sup>[1]</sup>); storage costs such as rent; and costs of handling the product such as equipment, warehouse and stock-keeping staff, stock losses/wastage, taxes, and so on.

As discussed in Chapter 5, acquisition/ordering costs come about regardless of the actual value of the goods. These costs include the salaries of those purchasing the product, costs of expediting the inventory, and so on.

### The Purpose of Inventory

So why do you need inventory? In a just-in-time manufacturing environment, inventory is considered waste. However, in environments where an organization suffers from poor cash flow or lacks strong control over (1) electronic information transfer among all departments and all significant suppliers, (2) lead times, and (3) quality of materials received, inventory plays important roles. Some of the more important reasons for obtaining and holding inventory are:

- **Predictability:** To engage in capacity planning and production scheduling, you need to control how much raw material and how many parts and subassemblies you process at a given time. Inventory buffers what you need from what you process.
- **Fluctuations in demand:** A supply of inventory on hand is protection. You don’t always know how much you are likely to need at any given time, but you still need to satisfy customer or production demand on time. If you can see how customers are acting in the supply chain, surprises in fluctuations in demand are held to a minimum.
- **Unreliability of supply:** Inventory protects you from unreliable suppliers or when an item is scarce and a steady supply is difficult to ensure. Whenever possible, unreliable suppliers should be rehabilitated through discussions or replaced. Rehabilitation can be accomplished through master purchase orders with timed product releases, price or term penalties for nonperformance, better verbal and electronic communications between the parties, and so on. This

will lower your on-hand inventory needs.

- **Price protection:** Buying quantities of inventory at appropriate times helps avoid the impact of cost inflation. Note that contracting to assure a price does not require actually taking delivery at the time of purchase. Many suppliers prefer to deliver periodically rather than to ship an entire year's supply of a particular stock keeping unit (SKU) at one time. (Note: The acronym "SKU" is a common term in the inventory world. It generally stands for a specific numeric or alpha-numeric identifier for a specific item.)
- **Quantity discounts:** Often bulk discounts are available if you buy in large rather than in small quantities.
- **Lower ordering costs:** If you buy a larger quantity of an item less frequently, the ordering costs are less than buying smaller quantities over and over again. (The costs of holding the item for a longer period of time, however, will be greater.) See Chapter 5, Planning and Replenishment Concepts. To hold down ordering costs and to lock in favorable pricing, many organizations issue blanket purchase orders coupled with periodic release and receiving dates of the SKUs.

## Types of Stock

Inventory is basically divided into raw materials, finished goods, and work-in-process. Remember:

- **Raw materials:** Used to produce partial products or completed goods.
- **Finished product:** This is product ready for current customer sales. It can also be used to buffer manufacturing from predictable or unpredictable market demand. In other words, a manufacturing company can make up a supply of toys during the year for predictably higher sales during the holiday season.
- **Work-in-process (WIP):** Items are considered to be WIP during the time raw material is being converted into partial product, subassemblies, and finished product. WIP should be kept to a minimum. WIP occurs because of such things as work delays, long movement times between operations, and queuing bottlenecks.

Other categories of inventory should be considered from a functional standpoint:

- **Consumables:** Light bulbs, hand towels, computer and photocopying paper, brochures, tape, envelopes, cleaning materials, lubricants, fertilizer, paint, dunnage (packing materials), and so on are used in many operations. These are often treated like raw materials.
- **Service, repair, replacement, and spare items (S&R items):** These are after-market items used to "keep things going." As long as a machine or device of some type is being used (in the market) and will need service and repair in the future, it will never be obsolete. S&R items should not be treated like finished goods for purposes of forecasting the quantity level of your normal stock.
- Quantity levels of S&R items will be based on such considerations as preventive maintenance schedules, predicted failure rates, and dates of various items of equipment. For example, if an organization replaced its fluorescent tubes on an as-needed, on-failure basis, it would need a larger supply of these lights on hand at all times. However, if the same company relamped all of its ballasts once a year, it would buy a large quantity of tubes at one time and only keep a small supply on hand on an ongoing basis.
- Because S&R items are never "obsolete" or "dead" until the equipment or device they are to be used for is no longer in service, these items should not be included in calculating dead stock levels. See Chapter 2.
- **Buffer/safety inventory:** This type of inventory can serve various purposes, such as:
  - Compensating for demand and supply uncertainties.
  - "Decoupling" and separating different parts of your operation so that they can function independently from one another. See [Exhibit 1–1](#).
- **Anticipation Stock:** This is inventory produced in anticipation of an upcoming season, such as fancy chocolates for Mother's Day or Valentine's Day. Failure to sell in the anticipated period could be disastrous, because you may be left with considerable amounts of stock past its perceived shelf life.
- **Transit inventory:** This is inventory en route from one place to another. It could be argued that product moving within a facility is transit inventory, but the common meaning refers to items moving within the distribution channel toward you,

items outside of your facility, or items en route from your facility to the customer.

### Exhibit 1-1: Points Along the Channel of Distribution Where Buffer Stock Is Needed to Decouple Operations

→		
<b>Suppliers</b>	Allows Procurement time to prepare purchase orders, place orders, and control timing and modes of delivery. Protects against uncertainties in lead times.	<b>Procurement (purchasing)</b>
<b>Procurement (purchasing)</b>	Provides time to plan and produce items while Procurement is interacting with Suppliers. Prevents downtime and allows for a continuous flow.	<b>Production</b>
<b>Production</b>	Provides Marketing with product to sell while Production is producing items for future sale.	<b>Marketing</b>
<b>Marketing</b>	Provides Distribution with the product Marketing has sold. Immediate customer satisfaction.	<b>Distribution</b>
<b>Distribution</b>	Offers the Intermediary items to deliver to the Consumer/End User.	<b>Intermediary (e.g., UPS, truck line, rail line, etc.)</b>
<b>Intermediary (e.g., UPS, truck line, rail line, etc.)</b>	Satisfies the Consumer/End User with product while it is waiting for deliveries from the Intermediary.	<b>Consumer/End User</b>

Transit stock highlights the need to understand not only how inventory physically moves through your system, but also how and when it shows up in your records. If, for example, 500 widgets appeared as part of existing stock while they were still en route to you, your record count would include them, but your shelf count would be 500 widgets short.

How could stock show up as part of inventory before it actually arrives? The answer depends on when title to the widgets transferred to you. Did title transfer when the product left the shipper's dock, or did it transfer only after the items arrived at your site and were signed for? If title transferred when the product left the shipper's dock, it was then counted as part of your total inventory. As a result, your total record count would not match your shelf count. For example, if (a) a stockkeeper did not understand that an item's paper life had floated ahead of its real life and (b) the stockkeeper did not have a breakdown of items on hand, on order, in transit, and immediately available, (c) the stockkeeper would find a mismatch between the shelf and record counts. Inappropriate adjustments might then be made.

The Uniform Commercial Code (UCC) governs the transfer of title to product. The UCC has been adopted by most states. Article 2 of the UCC covers the sale of goods.

<sup>[1]</sup>If you have \$2 million tied up in inventory, you cannot earn money (interest) on that money. If you could earn 10 percent interest on that \$2 million, you could earn \$200,000. Not being able to earn this money is an opportunity cost.

### Tracking the Paper Life

To gain an understanding of the relationship between an item's real life and its paper life, follow a single item on its path through your system. In other words, track an item's physical movement through your facility while noting what is happening to its paper life during that same time period. You will be able to discover when one of these lives moves ahead of the other and when there are system errors, such as an item is moved but no paperwork exists authorizing that action.

Exhibit 1–2 provides an example of what could happen if an item's paper life and real life begin to leapfrog ahead or behind one another without the stockkeeper understanding the process.

### Exhibit 1-2: Real Life and Paper Life Leap Frog

Carr Enterprises operates six days per week, Monday through Saturday. It has an inventory system that is updated at 4:45 P.M. every day. In spite of the daily updating, the record count and the shelf count in Small Stock Room #1 are often out of balance.

Carr's warehouse manager, Nate, has decided to count everything in Small Stock Room #1 every Friday. He does so for two months. At the end of that time he is angry—the numbers still don't match.

Carr hires Shawn, an ace inventory detective, to help track down the source of the problem. Nate is flabbergasted. He

believes he is counting very carefully, and if there is a problem, it is with the computer. Nate declares to anyone who will listen that “the computer is always wrong.”

On Monday at 5:15 P.M., Shawn suggests that they examine an item that seems to be out of balance from the previous week’s count.

Nate declares, “I’ll show you one.” Thrusting a brand new inventory Stock Status Report in front of Shawn’s nose, Nate states, “Look at these widgets. It says there are 12 of them in stock. When we counted them last week there were 12 of them. I looked at this report this morning, and it said there were 13 of them. Now it says there are 12 of them, but I just looked in the stock room and there are actually 15 of them. See, I told you—the computer’s always wrong.”

Shawn asks if he can see Nate’s count sheet with the widgets on it from the previous week. The sheet looks like this:

Stock Status Report					
Location	Part Number	Description	U/M	Quantity	
AB1002	9063	Gidgets	ea	127	
AB1003	2164	Gadgets	ctn	36	
AB1004	1878	Widgets	ea	<del>12</del>	12
AB1005	9201	Doodads	dz	98	
AB1006	5769	Whoohahs	pkg	<del>105</del>	101

Shawn asks what the notations mean.

Nate replies that when the wrong quantity was on the count sheet, he would “X” it out, write in the correct quantity, and turn the sheet into data entry.

Shawn asked when Nate turned his sheets in. Nate replied, “Friday—why?”

Shawn said, “I understand that you turn the sheets in on Friday. I’m asking, what time do you turn them in?” Nate says he does it at about 5 P.M. Thinking Shawn is criticizing him, Nate defensively states, “Hey, they’re busy in data entry from 4:30 or so. They’re doing cutoff and updates and stuff like that. So I wait until they’re done.”

Shawn asks when Nate’s count sheets are keyed into the system. Nate says he doesn’t know. Shawn asks Hillary, the data entry clerk, when Nate’s sheets are keyed in. Hillary replies that she doesn’t put Nate’s work on the front burner, “if you know what I mean.” Shawn persists. He asks again, “Who keys Nate’s count sheets in and when are they done?” Hillary replies that she works on Saturday but leaves the sheets for Carolyn, the other data entry clerk, to input on Monday.

Shawn asks Hillary if she entered any widgets into the system on Saturday. She says she entered three of them into the system on Saturday. Shawn asks Carolyn how she handles inputting Nate’s information. She replies that she pulls up the item on her computer screen, checks to see if the total in the computer matches Nate’s handwritten amount, and if it doesn’t, she changes the amount in the system to match Nate’s number.

Shawn charts-out the flow of real life and paper life for the widgets, and he comes up with the following:

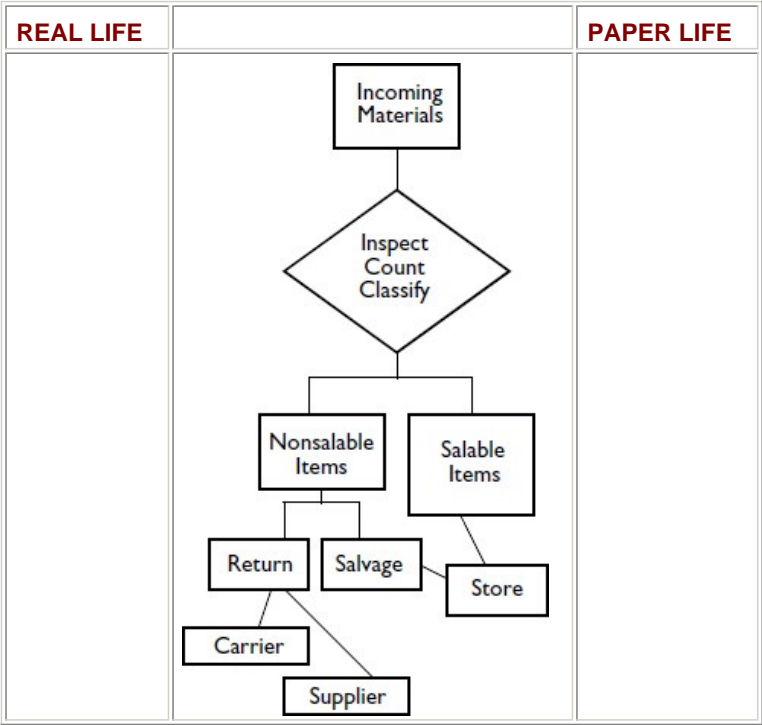
Day	Record Count	Shelf Count	Notes
Friday @ close of business	10	12	At the start of business on Friday, the system believes there are 10 widgets. There are actually 12. Nate does not note a plus or minus amount on his count sheet. He X’s through the 10 and writes in 12. He does not turn in his count sheets until after the system has been updated for that day. At the close of business on Friday, the system still believes there are 10 widgets. There are actually 12.
Saturday @ close of business	13	15	No one enters Nate’s information on Saturday. Nate does not know this—he hasn’t checked. Three widgets are added into the system on Saturday. At the close of business on Saturday, the system believes there are 13 widgets in stock. There are actually 15.
Monday morning	13	15	Monday morning’s Stock Status Report reflects Saturday’s numbers. During the day on Monday, Carolyn wipes out the record of 13 and enters the quantity of 12 from Nate’s sheets.

Monday @ close of business	12	15	When the system is updated at 4:45 P.M. on Monday, the stock record and new Stock Status Report reflects that there are 12 widgets. There are actually 15. When Nate began counting on Friday the system was off by 2, and when all was said and done, it was off by 3! [a]
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[a] If you are going to note stock quantity changes but the information will not be input before there are intervening inventory events, you must use a “plus/minus” notation system (e.g., +3; −4; ±0). By using a plus/minus notation system, the data entry clerk will add or subtract from the then current amount, which will already include any intervening events.

Exhibit 1-3: Tracking the Paper Life

Instructions: At each stage of the flow chart below note:



1. Where is the item physically?
2. What pieces of paper(s) authorize that?
3. When is information entered into your computer system?
4. Who is supposed to write something down? What are they supposed to write down? When were they supposed to write it down? Who are they supposed to give the piece of paper to? What is that person supposed to do with it? When are they supposed to pass the piece of paper along?
5. Does any item change its unit of measure within the system even though it retains the same physical form. For example: Item X is purchased by the master case. When it is entered into the database, a conversion table converts each case into the four cartons within the master case. However, for ease of handling, the cartons remain in the master case for storage. Visually this item appears as a single unit while it will be sold or used as four separate items.
6. After the paper chase, where is the item physically?

As can be seen in Exhibit 1–2, an item’s real life and paper life can leapfrog around one another. It is important to understand that these lives can exist independently of one another. To comprehend your own system, you must trace how both product and information move through the system. See Exhibit 1–3 for a simple method of breaking down a portion of your system to gain an understanding of your physical item and database float times.

Electronic Data Interchange

Stockkeepers who do not understand how and when an item's paper life is first created within a system become even more confused if there is no hard paper copy audit trail they can follow. How could:

- An order be placed?
- An order be accepted?
- Confirmation of the order be given?
- Shipping instructions be given?
- Notice of shipping arrangements be given?
- A paper life be created for an item in advance of it entering the facility?

All occur without any hard paper copies of these transactions. All of these events and others can occur in a paperless environment through electronic data interchange.

Electronic data interchange (EDI) is where routine business transactions are sent over standard communication lines (such as telephone lines) between computers within a company or between your computer and that of a vendor.

An example of EDI within a company occurs at the time of order entry, when information about that order is electronically transmitted to shipping or operations for order selection and shipping, to accounting for billing purposes, to sales for order verification, and so on.

An example of EDI with a vendor occurs when you electronically place an order directly from your computer into the vendor's computer. The vendor's computer then electronically confirms the order and transmits information about the order to the vendor's shipping and accounting departments. The vendor's computer also electronically notifies a carrier of the upcoming shipment. The carrier's computer electronically confirms the pickup and provides the vendor with pickup and delivery information. The vendor's computer then notifies your computer of the date, time, etc., of the upcoming delivery. All of this is accomplished without any human intervention other than the original placement of the order.

For EDI to work, all of the system participants must agree to strict rules regarding message content, format, and structure.

### Recap

The objective of this chapter was to point out that inventory exists within your system as both a physical item and as an item in your records.

There are many reasons for obtaining and holding inventory, and inventory can play a variety of roles within the life of any organization.

To control and manage the items coming into, through, and out of your facility, it is important to understand not only where an item is physically located at any given time, but also how that existence is being acknowledged within the system.

### Review Questions

1. Inventory costs generally fall into: ?
  - a. sales expenditures.
  - b. work in process.
  - c. line during the annual physical inventory.
  - d. ordering costs and holding costs.
2. True or False ?

EDI is when routine business transactions are sent over standard communication lines.

  - a. True
  - b. False
3. True or False ?



Service and repair stock must never be retained beyond 5 years from date of purchase.

- a. True
- b. False

4. True or False

?

Anticipation stock is inventory en route from one place to another.

- a. True
- b. False

5. Which Article of the Uniform Commercial Code governs the sale of goods?

?

- a. 9
- b. 1
- c. 2
- d. 117

**Answers**

1. (d)

2. (a)

3. (b)

4. (b)

5. (c)