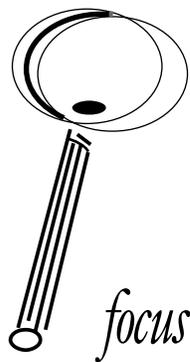


1

Inventory as Both a Tangible and an Intangible Object



Learning Objectives

By the end of this chapter, you should be able to:

- Analyze the tangible nature of your inventory.
- Describe how an item manifests itself as an intangible record count throughout an inventory system.
- Explain why inventory accuracy depends on understanding both *where* an item is physically and *how* that location is reflected in the organization's records.

INTRODUCTION

This chapter provides 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 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 or not *your records show* an item as being in-house, an item’s paper life can be just as important as its real life.



Self-Assessment 1–1

Understanding Your Inventory

Instructions: Answer each of the following questions by checking “Yes,” “No,” or “Don’t Know.”

1. Several times per week I am asked to locate product that appears in my company’s records but cannot actually be found.	Yes [] No [] Don’t know []
2. My company receives various items in one pack size but stores them in a different size, e.g., received as a single master case but stored as four cartons (which had been in the case).	Yes [] No [] Don’t know []
3. Everyone within my organization has immediate access to the following information on their computer screens or a paper copy: items on-hand, items on-order, items allocated, items in-transit, items actually available for sale or use.	Yes [] No [] Don’t know []

If you answered “Don’t Know” to Questions 2 or 3, you are urged to discuss Question 2 with your organization’s purchasing agent and Question 3 with the information technologies manager. For a discussion of the significance of understanding who within your organization actually has access to various items of information regarding inventory (for example, quantities on-hand, quantities allocated, etc.), see Chapter 6, *Why Inventory Systems Fail and How to Fix Them*.

THE TANGIBLE NATURE OF INVENTORY

All organizations keep inventory. *Inventory* includes a company’s raw materials, work in process, supplies used in operations, and finished goods. Inventory can be something as simple as a bottle of glass cleaner used as part of a building’s custodial program or something complex such as a mix of raw materials and subassemblies used in the manufacturing process.

For organizations that sell inventory directly (manufacturers, distributors, and retailers), the inventory itself is usually the primary value they add to the customer. These organizations also provide product information, customer support, pricing, and discounts and rebates as part of their total customer interface. However, if the inventory is not available when the customer wants it, the customer will be disappointed and may start looking for another supplier.

For other organizations (for example, banks, schools, hospitals, and the military), inventory is not the primary reason for being in business. However, these organizations must have the inventory they need when they need it, or they will not be able to function effectively or efficiently. Imagine banks without new account forms, schools with no textbooks, hospitals with no bandages, or the military with no uniforms.

Traditional-thinking organizations assume that they must carry inventory in stock in order to meet demand. Furthermore, accounting systems treat inventory as an asset, which adds value to the company. However, companies that embrace lean, just-in-time (JIT), and/or supply chain concepts understand that they don't necessarily have to carry inventory in stock. They are only required to have access to it when they *need* it. These companies understand that in many instances information can replace physical inventory and that information is much less expensive than actual inventory. Retailers don't carry substantial inventories of items just in case they decide to have a special promotion; instead, they plan the promotion in advance and have the manufacturer deliver the inventories just in time for the sale. Manufacturers understand the seasonality of their goods; they make snow blowers in time for the fall/early winter selling season and sandals and swim suits in time for late spring/summer. In fact, some mail-order or Internet-based retailers actually carry no stock themselves. They take orders from the customer, then have their suppliers drop-ship directly to the customer.

With that understanding, this course presents both the classic inventory management and control techniques and an overview of newer approaches.

The Purpose of Inventory

So why do you need inventory? As we will explore in Chapter 5, just-in-time (JIT) and lean consider most inventory to be *waste*. The only inventory that is required is that which is actually being processed in a manufacturing environment or being delivered to a customer in a distribution environment. Leading companies in all industries recognize that inventory usually indicates a potential area of improvement; it is a symptom rather than an asset.

Traditional approaches to inventory management include six reasons for carrying inventory. While each of the reasons seems valid, especially in the short term, each reason also represents a failure to operate in the most efficient or effective manner. Let's examine the six categories, with the idea that each one is showing your company how you can improve.

1. *Process buffer*: Inventory should be used to buffer processes only at strategic points. As viewed by a supply chain, a warehouse or distribution center is really just a process buffer—goods arrive in batches (pallets, truckloads, cartons, and so on) and are “processed” (distributed to the customer) in smaller lots. In a manufacturing company, processes frequently operate at different rates, thereby requiring inventory buffers. Over the long term, processes should be brought into synch with each other.
2. *Fluctuations in demand*: This inventory allows a supplier to satisfy customer demand that is higher than expected. However, inventory is an expensive substitute for information. When you can see actual usage of your product by the end customer as well as inventory levels in the supply chain, you can satisfy your customers while carrying minimal inventories. This approach requires you to reduce your lead times and those of your suppliers. You can use this same approach to help your suppliers reduce their inventories, and therefore their costs. As you will see in Chapter 5, another way to reduce the need for this type of inventory is to reduce the

resupply time. If the supply lead time can be reduced to one day or less, much less inventory is required.

3. *Unreliability of supply:* In the short run, inventory can (and should) be used as a buffer against unreliable suppliers (both internal, in your own company, and external, your outside suppliers). In the long run, you can work with suppliers to insure their reliability, or you can—and should—replace them. The total cost of supplier unreliability is usually far greater than any savings in purchase price. The best suppliers deliver “perfect” materials directly to the desired location inside your company on schedule. This is equally true for internal suppliers in a manufacturing company. If varying quality is a root cause of unpredictability, it should be addressed by an appropriate quality initiative (for example, Six Sigma or Total Quality Management).
4. *Price protection:* Buying large quantities at one time has been a traditional hedge against price increases. You can (and should) negotiate pricing and long-term contracts with key suppliers, but you should request multiple deliveries. As your suppliers implement lean practices, they will strongly prefer to ship smaller quantities at frequent intervals, rather than asking you to take delivery of the entire purchased amount at once. Pricing agreements should also include the possibility of cost reductions, automatically passing on the the supplier’s cost reductions.
5. *Quantity discounts:* Some suppliers offer discounts for buying large quantities. Quantity discounts work just like price protection. Quantity discounts are being replaced today by key supplier agreements, in which you agree to purchase your entire year’s usage of various product families from one supplier in exchange for highly favorable pricing, superb service, impeccable quality, and rapid response and delivery. This reflects a culture of partnering with key suppliers rather than treating them as adversaries.
6. *Lower ordering costs:* Traditionally companies looked at ordering costs as a necessary cost that should be traded off against carrying costs. However, today’s preferred way to lower ordering costs is to eliminate all non-value-added steps in the ordering cycle. Value stream mapping is a technique of flow-charting all steps in a process (such as placing an order), calculating the total cost and total elapsed time, then identifying all those steps that don’t really add value in the customer’s eyes and deciding how to eliminate them (Rother and Shook, 1998).

Types of Inventory

Inventory falls into four basic categories: raw materials, finished goods, work in process, and transit inventories.

- *Raw materials:* These items are purchased from a supplier and are unchanged.
- *Finished product:* This product is 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. Most WIP occurs from such things as queuing bottlenecks, work delays, long movement times between operations, missing components, and unavailability of tooling and machines.
- *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; however, the common meaning of the term related to items moving within the distribution channel toward you (but outside of your facility) or en route from your facility to the customer.

Important issues related to transit inventory are when and how it appears in your records. In other words, when and where does it show up in your record count? Test your current knowledge of transit stock by completing Self-Assessment 1–2: Understanding Transit Stock.



Self-Assessment 1–2

Understanding Transit Stock

Instructions: Answer each of the following questions by checking “Yes,” “No,” or “Don’t Know.”

1. My company buys product F.O.B. origin.	Yes [] No [] Don't know []
2. My company buys product F.O.B. destination.	Yes [] No [] Don't know []
3. My company's accounting/inventory software displays data fields showing items on hand, items in transit <i>but not yet counted</i> as being a part of existing stock, items allocated, items actually available for sale/use.	Yes [] No [] Don't know []
4. My company's accounting/inventory software displays data fields showing items on hand, items in transit <i>but counted</i> as being a part of existing stock, items allocated, items actually available for sale/use.	Yes [] No [] Don't know []
5. My company uses electronic data interchange.	Yes [] No [] Don't know []

If you answered “Don’t Know” to Questions 1 or 2 in this Self-Assessment, discuss these issues with your purchasing agent or financial officer. If you answered “Don’t Know” to Questions 3, 4, or 5 in this Self-Assessment, discuss these issues with your information technologies manager.

DISCUSSION

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

Self-Assessment 1–2 continues on next page.

Self-Assessment 1–2 continued from previous page.

appeared as part of existing stock while they were still en route to you, your record count would include them while your shelf count would be 500 short.

How could stock be recorded as a part of inventory before it actually arrives? To answer that question, you must ask, “When did title to the widgets transfer 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 and it was then counted as part of your total inventory, your total record count would not match your shelf count. If (a) a stock-keeper did not understand that the item’s paper life had floated ahead of its real life, (b) did not have breakdown of items on hand, on order, in transit, and immediately available, and (c) found a mismatch between the shelf and record counts, then she or he might make inappropriate adjustments.

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.

What Article 2-319 States	What It Means
(1) Unless otherwise agreed, the term <i>F.O.B.</i> (which means “free on board”) at a named place, even though used only in connection with the stated price, is a delivery term under which:	
(a) when the term is <i>F.O.B.</i> the place of shipment, the seller must at that place ship the goods in the manner provided in this article and bear the expense and risk of putting them into the possession of the carrier; or	This is <i>F.O.B.</i> origin and means that title shifts to the buyer when the goods are delivered to the carrier. Risk of loss while the product is in transit then shifts to the buyer. When the buyer receives notice of the shipment having been made, the goods are then often shown as being a part of the buyer’s total inventory. The transit inventory now has a paper life within the buyer’s system even though it is still not in the buyer’s facility. Buyers will purchase <i>F.O.B.</i> origin in order to control shipping methods, timing, and costs.
(b) when the term is <i>F.O.B.</i> the place of destination, the seller must at his own expense and risk transport the goods to that place and there tender delivery of them in the manner provided in this article.	This is <i>F.O.B.</i> destination and means that title and risk of loss while the goods are in transit stay with the seller until the product reaches the buyer’s dock and is accepted. Unless the buyer’s system reflects items in transit, the goods have neither a real nor a paper life within the system.

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 the like are used in many operations. These items 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, repair, etc., in the future, these items are never 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 are 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 moderate supply of these lights on hand at all times. However, if the same company relamped all of its ballasts once per year, it would buy a large quantity of tubes all at one time and only keep a small supply on hand on an ongoing basis.
 - Since S&R items are never “obsolete” or “dead” until the equipment or device they are used for is no longer in service, these items should not be included in calculating dead stock levels. See Chapter 2, *Inventory as Money, Arguments in Favor of Disposing of Dead Stock*.
- *Buffer/safety inventory*: This type of inventory can serve various purposes, such as:
 - Compensating for demand and supply uncertainties.
 - Holding it to “decouple” and separate different parts of your operation so that they can function independently of one another as shown in Exhibit 1–1. The amount of inventory in each buffer should be balanced against the business need. It is not necessary to have inventory in all potential buffer areas.
- *Anticipation stock*: This is inventory produced in anticipation of an upcoming season—for example, fancy chocolates made up in advance of 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.

Inventory Costs

Inventory brings with it a number of costs. These costs can include:

- Dollars to acquire it
- Space to store it
- Labor to receive, check quality, put away, retrieve, select, pack, ship, and account for it
- Deterioration, damage, and obsolescence
- Theft

Inventory costs generally fall into two categories: 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

E**xhibit 1–1****Points Along the Channel of Distribution Where Buffer Stock May Be Used to Decouple Operations**

From	Purpose	To
Suppliers	Allows Procurement time to prepare purchase orders, place orders, and control timing and modes of delivery. Protects against uncertainties in lead times.	Procurement (Purchasing)
Production	Provides Marketing/Distribution with product to sell while Production is producing items for future sale. Immediate customer satisfaction.	Marketing/Distribution
Distribution	Offers the intermediary items to deliver to the consumer/end user.	Intermediary (UPS, truck line, rail line, etc.)
Intermediary (UPS, truck line, rail line, etc.)	Satisfies the consumer/end user with product while it is waiting for deliveries from the intermediary.	Consumer/end user

product, costs of expediting the inventory, and so on. For a complete discussion of ordering costs see Chapter 5, *Planning and Replenishment Concepts*.

Holding, or carrying, costs include the cost of capital tied up in inventory (the opportunity cost of money²), storage costs (rent, for example), and costs of handling the product (equipment, warehouse and stockkeeping staff, stock losses/wastage, taxes, etc.). For a complete discussion of carrying costs see Chapter 2, *Inventory as Money*.

TRACKING THE PAPER LIFE

In order for you to gain an understanding of the relationship between an item's real life and its paper life within your own system, you should follow a single item on its path through that 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 discover instances in which one of these lives moves ahead of the other and instances of system errors—when an item is moved but no paperwork authorizes that action, for example.

²If you have \$2 million tied up in inventory, you cannot earn money (that is, 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 that \$200,000 is an opportunity cost.

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



Exhibit 1–2

When Real Life and Paper Life Leapfrog

Carr Enterprises operates six days per week, Monday through Saturday. Its inventory system 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 ace inventory detective Shawn to help track down the source of the problem. Nate is flabbergasted. He believes he is counting very carefully; 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 count 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	10	12
AB1005	9201	Doodads	dz	98	
AB1006	5769	Whoohahs	pkg	105	101

Shawn asks what the notations mean.

Nate replies that when the wrong quantity was on the count sheet he would cross it out, write in the correct quantity, and turn the sheet in to 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, stuff like that. So I wait until they’re done.”

Exhibit 1–2 continues on next page.

Exhibit 1–2 continued from previous page.

Shawn asks when Nate’s count sheets are keyed into the system. Nate says he doesn’t know.

Shawn asks the data entry clerk Hillary when Nate’s sheets are keyed in. Hillary replies that she doesn’t put Nate’s work on the front burner, if Shawn knows what she means. 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 3 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. 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 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 crosses out 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!

As can be seen from the example 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.

The moral of this story: If you are going to note stock quantity changes but there will be intervening inventory events before anyone inputs the

information, you must use a “plus/minus” notation system, for example, +3; -4; ±0. When you use 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.

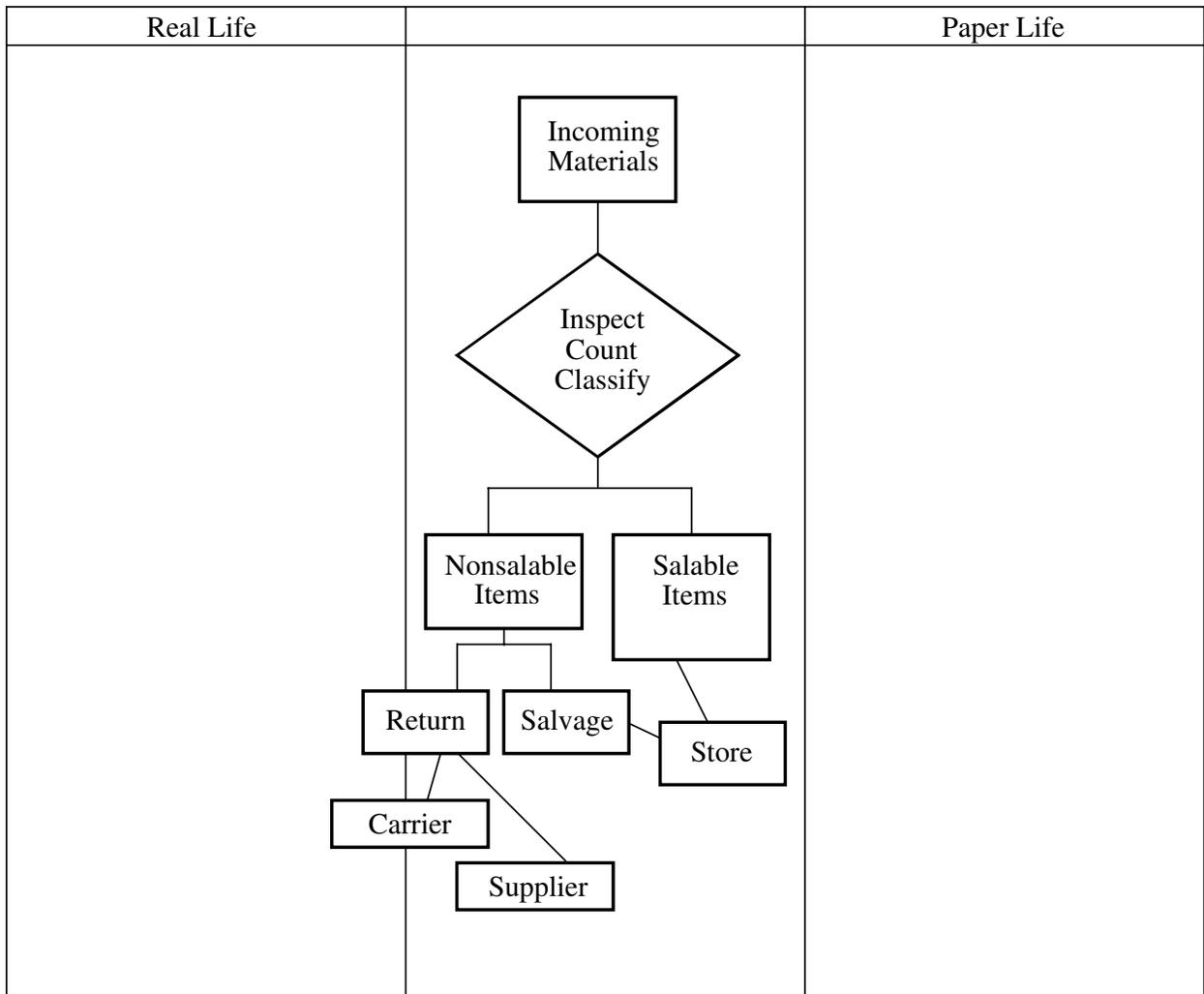


Activity 1-1

Tracking the Paper Life

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

1. Where is the item physically?
2. What piece(s) of paper authorize(s) that?
3. Is information entered into your computer system at one point or another?
4. Who is supposed to write something down? What are they supposed to write down? When were they supposed to write it down? To whom are they supposed to give the piece of paper? What is that person supposed to do with it? When are they supposed to pass the piece of paper along?
5. After the paper chase, where is the item physically?



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 copy (paper) 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 for an item be created in advance of it entering the facility

all without there being any paper copies of these transactions existing? All of these events and more can occur in a paperless environment through electronic data interchange.

Electronic data interchange (EDI) occurs when routine business transactions are sent over standard communication lines (telephone lines, for example) between your computer and that of a customer or vendor.

Consider this example of EDI with a vendor. You place an order electronically 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, and other details of the upcoming delivery. All of this would be accomplished without any human intervention other than the original placement of the order. EDI works in an equivalent manner with customers.

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



An organization's inventory—whether it is sold directly to the customer (as it is for manufacturers, distributors, and retailers) or is linked to a service (as it is for banks, schools, and hospitals)—is a critical aspect of the value all organizations add to their customers.

A key point in managing inventory is to understand how an item's real life and its paper life can exist independently of one another. To comprehend their own systems, managers must be able to trace how both product and information move through the system.

Important issues related to the various types of stock—raw materials, finished product, work in process, and transit inventory—include when and how stock appears in your records. The Uniform Commercial Code's Article

2-319 governs the transfer of title to product and includes terms that spell out possession of transit inventory.

In order 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 and where the item exists in the inventory accounting system at any given time.



Review Questions

1. Inventory costs generally fall into: 1. (d)
 - (a) sales expenditures.
 - (b) work in process.
 - (c) line during the annual physical inventory.
 - (d) ordering costs and holding costs.

2. EDI is a process whereby: 2. (a)
 - (a) routine business transactions are sent over standard communication lines.
 - (b) accounting tasks are performed off site.
 - (c) delivery schedules are automated.
 - (d) the purchasing function is outsourced.

3. Service and repair stock: 3. (b)
 - (a) must never be retained beyond five years from date of purchase.
 - (b) are items used to “keep things going.”
 - (c) should be treated like finished goods for forecasting purposes.
 - (d) are often treated like raw materials.

4. Anticipation stock is: 4. (b)
 - (a) inventory en route from one place to another.
 - (b) inventory produced to meet demand for an upcoming season.
 - (c) a relatively risk-free investment.
 - (d) kept at the same level all year.

5. Which article of the Uniform Commercial Code governs the sale of goods? 5. (c)
- (a) 9
 - (b) 1
 - (c) 2
 - (d) 117

