

Warehouses Without Inventory

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July 18, 2007

Abstract

Retailers and other distributors have used crossdocking for many years to reduce inventory and transportation costs, yet, for some crossdocking is an illusive goal. Does the problem lie with the company, or is there something structural that makes crossdocking right for one company and wrong for another? Here is how to decide if crossdocking is right for your firm, along with some lessons (most, learned the hard way) for implementation.

Crossdocking

Despite the tired image they conjure up in the minds of many professionals, warehouses¹ continue to serve a vital role in the modern economy. The increasingly service-based economy of the United States is a case in point: having moved much of its manufacturing overseas, it is left with the task of importing goods back into the country and distributing them through warehouses, which serve as necessary and efficient points of consolidation, storage, and distribution.

What makes warehouses distasteful is the thought that good money is tied up in products that are, literally, sitting on a shelf waiting to experience “random demand.” Worse, after items are requested, the distributor must pay workers to extract items, prepare them, and send them on to customers. Is all this really necessary, or is there a better way?

¹We use the term *warehouse* for simplicity. For our purposes, it is interchangeable with *distribution center* or *order fulfillment center*, according to taste.

The answer, of course, is “it depends.” Many years ago, large retailers separated in their thinking (whether consciously or not, I do not know) the inventory and consolidation functions of a warehouse. Why consolidate from stock in a warehouse, when we could consolidate shipments directly from vendors and gain efficiencies in transportation? The result was what we now call *crossdocking*—a way to effect the consolidation function of a warehouse without having to hold the inventory. For some retailers, crossdocking has led to dramatically reduced inventory costs, and has allowed them to reduce prices, increase profits, or both. For others, crossdocking has reduced inbound transportation costs from vendors by consolidating many, expensive less-than-truckload shipments into fewer, less-expensive full truckload shipments to stores.

But not every retailer uses crossdocking, and many that do, do not crossdock all of their products. How to know when crossdocking is the right logistics strategy? And, is crossdocking an all or nothing proposition? Is it ever best to crossdock some products and leave the rest to traditional warehousing?

What it is and why it works

First, let’s define crossdocking and distinguish it from what we’ll call “traditional warehousing.” Crossdocking is transferring shipments directly from inbound vehicles (typically trucks) to outbound vehicles, with very little if any storage in between. In the best possible situation, products never touch the floor or a shelf—they move directly from inbound truck to outbound truck.

Crossdocking is different than warehousing in that the destination of arriving goods is known *in advance or upon receipt*. In a warehousing system, goods arrive to replenish stock, against which customers make orders that are not known in advance. Operationally, knowing the destination of a shipment upon receipt means that a pallet or carton can be sent directly to its destination trailer. There is no need to store it, except, perhaps momentarily, in order to label it.

Crossdocks cover a wide range of facility designs, from bare, concrete floor buildings with truck doors around the exterior (Figure 1), to highly automated conveyor and sortation systems in distribution centers approaching 100,000 square meters. The former are most common when the crossdock receives and ships pallets; the latter when incoming trucks contain cartons and the operation is very high volume.



Figure 1: A pallet crossdock operated by a 3PL for Sam's Club (located, obviously, in the U.S.). The simplicity of these facilities keeps costs down.

The distribution systems continuum

Warehousing and crossdocking are part of a distribution continuum, illustrated in Figure 2. The third major way to get products from vendors to stores is *direct to stores*. Let's look at each.

Warehousing is default strategy: the warehouse orders from vendors goods that will be stocked and sold in stores. When stock at the store runs low, it orders replenishment from the warehouse, which in turn orders replenishment from vendors. As long as the warehouse does not run out of stock, the store has a ready supply from which to replenish. Warehousing has the highest inventory costs because safety stock—which buffers against stockouts—is held in three places: the vendor, the warehouse, and the store. Material handling costs are high because orders must be picked, assembled, and packed by workers. But the benefit of warehousing is *control*—replenishment stock for stores is readily available. Warehousing systems are responsive because replenishment stock is geographically close to stores, and it usually takes no more than a day to arrive. Warehouses are also good at handling very small quantities, which can be important for inventory management at stores.

Crossdocking sacrifices a bit of control by not holding inventory between the vendor and store, but, unlike shipping direct-to-stores, it recovers transportation efficiencies by consolidating small shipments into full truckloads. Eliminating an entire level of inventory again reduces costs, but in the case of crossdocking it comes with some drawbacks: (1) Lead time from order to delivery at the store is longer than with warehousing, so stores typically have to hold slightly more stock to hedge against stockouts. If vendors are far away, lead time could be several days. (2) Unlike direct delivery from vendors, crossdocking requires the retailer to buy (or lease) and operate crossdocks, or to pay a third-party logistics provider to do so. (3) Crossdocking requires greater coordination with vendors, sometimes with painful details of implementation.

Direct-to-stores has two main advantages: (1) it eliminates an entire layer of stock, leading to low inventory costs, and (2) there is no need to manage and pay for warehouses, so material handling costs are very low. The disadvantages are some loss of control of stock availability, high costs of receiving at stores (imagine weekly shipments from *every* vendor), and higher transportation costs. The latter point warrants some explanation: Retail stores are rarely restocked with entire truckloads of goods from a single vendor, which means most shipments arrive from vendors using less-than-truckload (LTL) or package carriers. Both modes are more expensive

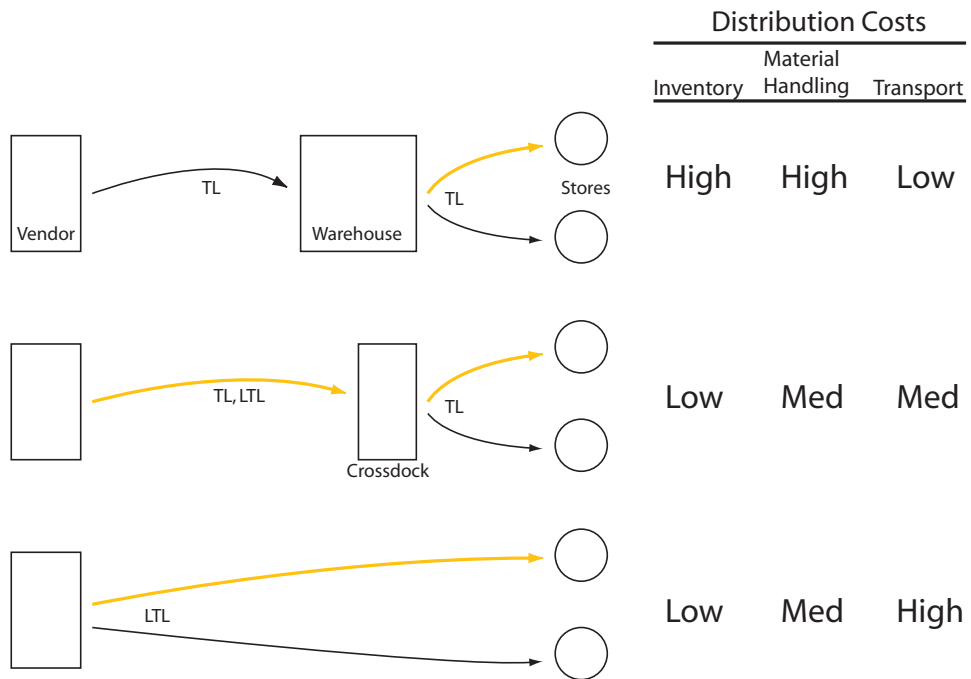


Figure 2: A continuum of strategies for retail distribution: warehousing on top, crossdocking in the middle, and direct-to-stores on bottom. Truckload shipping (TL) is less expensive than less-than-truckload (LTL). Yellow arcs represent required lead time after a replenishment order is generated by the store.

than truckload shipping, which is usually achievable with traditional warehousing or crossdocking.

The illustration should make clear that crossdocking is not appropriate for every retailer, but it does hold promise when the situation is right. And now the big question: When is the situation right?

From warehousing to crossdocking

Consider a traditional warehousing system in which high volumes of a product (say a truckload or more) move in from the vendor and out to stores everyday. Why maintain an inventory? If demand is fairly constant, then the inventory serves little purpose, and the product is a good candidate for crossdocking. If demand is highly variable or the cost of a stockout is high, then warehousing is probably the best strategy.

Strategy 1 *Use crossdocking for products with high, stable demand.*

Crossdocking is also attractive if customers are willing to wait a few days for delivery. For example, large appliances are often delivered after the sale in a showroom, which allows the retailer to ship directly from a vendor or central finished goods warehouse through a crossdock. In this case a “stock out” at the store is not a lost sale, and crossdocking is appropriate.

Strategy 2 *Use crossdocking for products for which customers are willing to “wait a few days.”*

Another form of this strategy is push distribution, which has become a popular business model in the U.S. In a typical application, products are bought at a discount and then pushed directly to stores according to estimated demand. Costco, Sam’s Club, and other discount retailers use crossdocking to execute this model. Customers of these companies expect products to appear and disappear, and typically have low expectations that a particular item will be in stock—a perfect situation for crossdocking.

Ross Dress for Less is a \$5 billion (U.S.) retailer specializing in “off-price” merchandise—mostly name-brand clothing, accessories and household items. Buyers for Ross scour the marketplace looking for production overruns, price mark-downs, and other opportunities to buy products at a significant discount. When they find a bargain, they buy large quantities and, if the item is season, they push out the merchandise to stores. Retail outlets do not know what they are stocking until they see it on the receiving dock.

Although Ross does order and hold some traditional inventory, the majority of its merchandise is bought at a significant discount and distributed through a network of 24 crossdocks. Discounted merchandise comes to Ross *not* store-ready, so goods must be received, tagged and sorted in a distribution center, which then sends large, store-ready cartons to a crossdock near the destination store. At the crossdock, store-ready cartons join merchandise arriving from other distribution centers, and all are sorted onto outbound trailers. Most of the inventory in the Ross system is moving—incurring effectively no holding cost—or in front of customers in the stores.

Crossdocking works for Ross because the distribution system has, in a sense, *no* variability of demand from stores, which must stock whatever the buyers buy, in a completely centralized, push system. Ross’s retail customers are “trained” to know that if they see an item they like, they should buy it immediately, because there is no guarantee it will be there tomorrow.

Strategy 3 *Push distribution systems should crossdock everything that can be sold in stores now.*

Costco is a quintessential big-box retailer, in which customers roam aisles of pallet racks in a clean but authentic warehouse, picking products directly off of pallets and loading them into shopping carts. Because the store displays pallet quantities, crossdocks in the Costco system receive and ship pallets. Costco operates a mixture of direct-to-store shipments (due to extremely high volumes in stores) and crossdocking. Their largest vendors attach labels to store-ready pallets, which are easily moved from inbound to outbound trucks at the crossdock.

Just as at Ross, customers at Costco are trained to buy on sight. Because they have little expectation of finding particular items there, customers are rarely disappointed by a traditional “stock out.”

Both Ross Dress for Less and Costco use *delayed allocation* to reduce inventory costs even further (see Figure 3). Because the lead time in a crossdocking system is longer than in a traditional warehousing system, demand at stores *during* the lead time could throw off replenishment quantities. By aggregating orders to a vendor from several stores, and then making a final allocation at the last possible moment, replenishment quantities are as accurate as possible, and inventory costs are reduced.

The problem with delayed allocation is that material handling costs in the crossdock are higher because workers must sort and label incoming products, rather than simply moving them to outbound trailers. And so, a tradeoff: delayed allocation reduces inventory costs slightly, but increases material handling costs slightly.

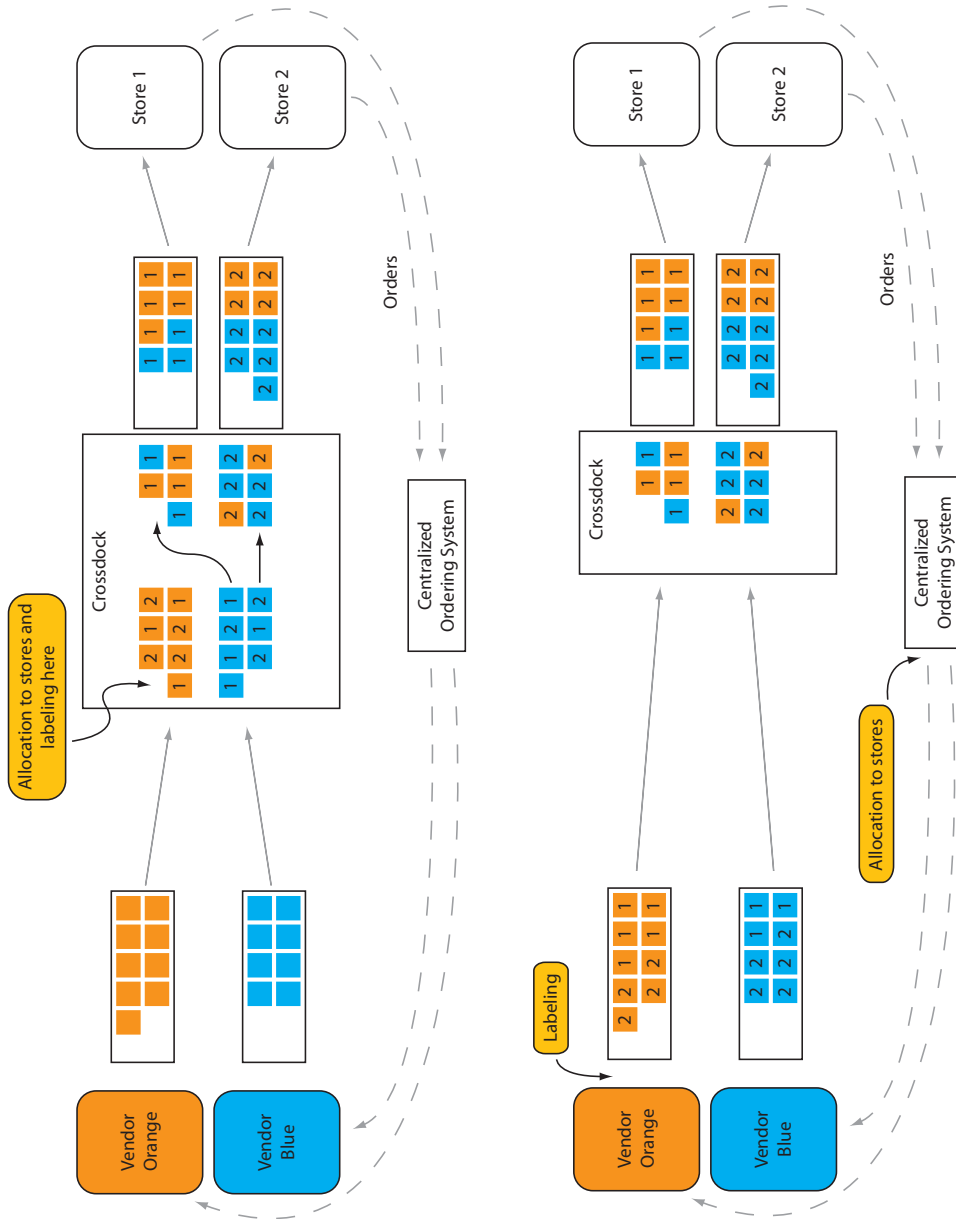


Figure 3: An illustration of delayed allocation (top) and allocation upon order. Shipments in the top figure are allocated to stores and labeled appropriately after they arrive at the crossdock. The system in the lower figure likely would have lower material handling costs.

Strategy 4 *If inventory costs are a concern, delay the allocation of incoming products until they arrive at the crossdock; otherwise, allocate at the vendor to reduce material handling costs.*

From direct-to-stores to crossdocking

Home Depot’s experience with crossdocking is an excellent example of how the growth of a firm can make crossdocking more, and then eventually less attractive. In its early days, Home Depot viewed its stores *as* warehouses, and so the direct-to-store model made sense. Homeowners and contractors seemed willing to drive the extra mile to get good bargains from a “giant hardware store,” so Home Depot essentially didn’t have stores—just warehouses. Direct-to-store shipping worked well because stores were located in major metropolitan areas and sales volumes were high.

But as their business grew rapidly in the 1990s and new, smaller stores opened in more remote locations, replenishment quantities got smaller and transportation costs went up. It was clear that the direct-to-stores model was untenable in the long run, so in the early 2000s, Home Depot moved away from direct-to-store deliveries toward crossdocking. The primary motivation was a desire to reduce transportation costs.

By the mid-2000s, Home Depot had built a network of a dozen or more crossdocks serving markets in the U.S. and Mexico. Each Home Depot was assigned a crossdock, and store orders placed to participating vendors were consolidated and sent as a single, weekly order. Vendors sent (primarily) truckloads to the crossdock, which consolidated shipments and delivered them, again in truckload quantities, to stores. Vendors liked the program because their shipping costs went down, and Home Depot enjoyed the lower landed cost of goods.

All along, Home Depot viewed crossdocking as an interim strategy that would pave the way for regional distribution centers operating according to a warehousing model. Continued pressure to increase the number of skus in stores and reduce inventory costs with smaller shipments would make warehousing more and more attractive. In the end, Home Depot is likely to operate a mixture of warehousing, crossdocking, and even direct-to-store deliveries, depending on the vendor, store, and product.

All of which makes the point that crossdocking ought not to be seen as the single answer to logistics strategy, but rather as part of the portfolio of techniques that suits every vendor-store-product combination.



Figure 4: Congestion at a retail crossdock in the northeastern U.S. At the time this photograph was taken, trailers waited an average of 3 days in the yard to be unloaded. This retailer underestimated the difficulting of material handling on the dock.

Management issues

Whether a company is moving away from a direct-to-store or warehousing model, there are several issues that should be managed well for a successful implementation of crossdocking. The first may be unexpected.

Strategy 5 *Manage material handling to reduce costs and crossdock more products.*

Material handling is not usually a topic that sells well in the boardroom, but for crossdocking it is critical. Because material handling is member of the triad of distribution costs (along with inventory and transportation), it can make or break a crossdocking implementation.

For example, if a retailer is moving from direct vendor delivery to crossdocking, material handling costs are payment for the anticipated savings



Figure 5: The well-organized floor of a Costco crossdock, a marked contrast to the crossdock in Figure 4. Pallets spend an average 30 minutes in this crossdock.

in transportation costs. Failure to execute inside the crossdock can overwhelm the transportation savings, or, worse, can result in shipment damage or significant delays (see Figures 4 and 5).

A second issue might be an insult to the conscientious, but here it is anyway:

Strategy 6 *Analyze costs, carefully.*

Crossdocking is primarily a cost-cutting technique, and so its justification relies on cost analysis. The problem lies in the types of costs involved. Inventory costs, in particular, can be difficult to determine precisely, and there is a temptation to ignore, or at least not to assess very well, the costs of material handling. Home Depot analyzed vendors one by one to determine which would participate in the crossdocking program. Where there was no benefit, the vendor did not participate.

Careful cost accounting has another benefit: the better a firm understands its costs of crossdocking, the better the chance that the right products and vendors will be included. Overstating material handling costs, for example, could exclude some products that rightly ought to be crossdocked.

Strategy 7 *Work closely with vendors to make sure they succeed.*

The demands of crossdocking on a vendor should not be underestimated: IT systems must be connected, requirements for labeling and shipment preps must be met, deliveries to the retailer's dock must be precisely timed, and so on. And then there are the *little* things: In an effort to reduce material handling costs at a Costco crossdock in California, managers purchased several automated palletjacks that could carry 4 pallets per trip (see Figure 6). The idea was that workers could enter a trailer, quickly scoop up 4 pallets (or 8 if double stacked), and deliver them to outbound shipping queues. Alas, vendors did not consistently load pallets in the correct orientation in the trailer, and workers frequently met the third or fourth pallet with a "thud."

Crossdocking has been a stunning success for many retailers, but it must not be viewed as the right solution for every firm. Different cost structures, business models, and product mixes may make warehousing or direct-to-stores delivery the right approach. For most retailers, the right approach is probably a combination of all three.



Figure 6: Workers at a Costco crossdock in California. The vehicle closest to the camera can transport 4 pallets at a time. Effective use of this labor-saving device requires vendors to orient pallets consistently in the trailer.