



# Commonwealth

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## E-Commerce in the Distribution Center: Making a Graceful Transition

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A Ten-Step Program for Adapting a Distribution Center to the  
Direct-to-Consumer Channel

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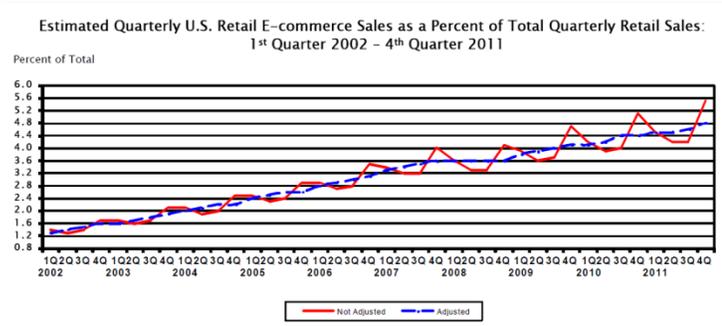
Here to Stay

E-commerce – the term conjures up a disparate set of images depending on the reader. The average consumer may have a pleasant image of hassle-free shopping with merchandise delivered directly to their door. The day-trader may remember with chagrin the “dot-com bust” of the early 2000’s, fueled in part by too many companies rushing to sell their products directly to the consumer without first mastering the logistics implications. The corporate executive may view e-commerce as a profitable new sales channel, while the Chief Supply Chain Officer may view it as a dreaded trend that complicates an operational ecosystem that has taken years to create.

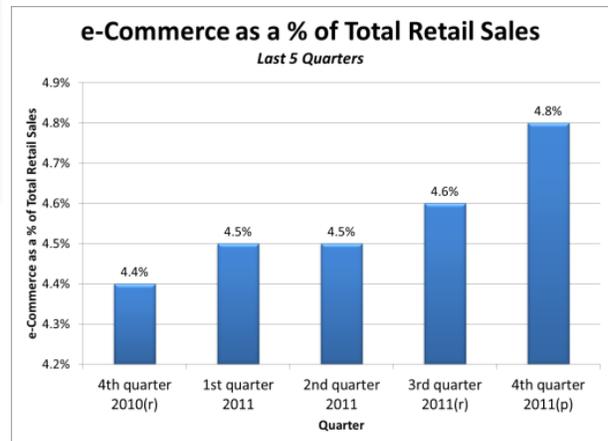
*“E-commerce represents the expressed will of millions of individual consumers who have voted with their pocketbooks for their channel of choice.”*

Regardless of the perspective of the reader, one cannot dispute that e-commerce is now a permanent fixture in the consumer goods supply chain. Unlike some distribution trends which have risen and fallen on the whims of retail compliance mandates, e-commerce represents the expressed will of millions of individual consumers who have voted with their pocketbooks for their channel of choice. Over the last decade, e-commerce sales have charted a steady increase from 1.2% of total retail sales in 2002 to 4.8% today (Figure 1). Growth continues to be strong through the last five quarters as the U.S. economy cautiously emerges from recession.

Figure 1: E-commerce trend over time



Source: U.S. Department of Commerce, February, 2012



## Six Scenarios for e-Commerce Distribution

What does all this mean for companies in the consumer goods supply chain? Companies feel the effects of this consumer shift differently depending on whether they are a manufacturer or a retailer, and depending on which channels they may already be serving. Commonwealth has identified six (6) basic scenarios that companies are likely to find themselves in with respect to their e-commerce adoption strategy:

1. Manufacturers filling e-commerce orders directly to their consumer clients
2. Manufacturers filling e-commerce orders on behalf of retailers
3. Pure e-commerce retailers
4. Multi-channel retailers
5. Companies that have outsourced the e-commerce channel
6. 3PLs that specialize in e-commerce

A company's e-commerce strategy will vary based upon which scenario they find themselves in. Subsequent sections of this report will discuss ten (10) specific tactics which can be employed to execute these strategies.

### Scenario #1: Manufacturers Filling e-Commerce Orders Directly to their Consumer Clients

Manufacturers filling their own consumer orders often have the greatest level of control over the levels of e-commerce in their supply chain, as they can gradually choose which products to offer directly to the consumer, and how aggressively to promote them. As the initial shift to e-commerce began, some manufacturers resisted selling their product directly to the consumer – both to avoid competing with their existing wholesale or retail channels, or to avoid the headaches of managing e-commerce logistics. Commonwealth has had a number of conversations with manufacturers recently that would suggest that some of those companies are revisiting this strategy and gradually introducing e-commerce on their corporate websites. For these companies, e-commerce represents a new way of picking and shipping orders – often very different from the full case or full pallet orders they are used to handling.

Many of these manufacturers address e-commerce by setting up small sub-sections of an existing distribution center to manage these orders. Since these companies control their e-commerce destiny, the distribution center rarely is overwhelmed with orders, but the handling of these orders is usually done rather inefficiently since economies of scale do not exist. Service levels may be good, but average labor content per order is high.

1. Manufacturers Filling e-Commerce Orders Directly to Their Consumer Clients	
Advantages	<ul style="list-style-type: none"><li>• Greater control over the growth of the e-commerce channel</li></ul>
Disadvantages	<ul style="list-style-type: none"><li>• Danger of competing with or cannibalizing other sales channels</li><li>• Few economies of scale at first</li></ul>
Common Response Strategies	<ul style="list-style-type: none"><li>• Gradually introduce e-commerce in the distribution center with a phased approach to automation</li><li>• E-commerce “warehouse within a warehouse”</li><li>• Tactics 1,2 3, 4</li></ul>

### Scenario #2: Manufacturers Filling e-Commerce Orders on Behalf of Retailers

While some companies have had the luxury of planning their gradual transition to e-commerce, other manufacturers have had the stakes raised as many of their retail clients are now requiring that they begin filling e-commerce orders directly to the consumer on the retailer's behalf. For these companies, in addition to the normal challenges of e-commerce, retail compliance mandates must now be met.

These manufacturers may have little or no e-commerce business of their own, but in order to retain or expand their business with retail customers, they are pressured to begin fulfilling direct-to-consumer orders for these retail clients. In con-



trast with other initiatives, e-commerce retail mandates tend to be “softer” mandates, motivated by the carrot, not the stick – for now. Manufacturers may not be *required* to handle this business, but they have a potentially large opportunity to fill these orders if they are able to take it on. Retail-compliant e-commerce orders are more challenging to fill for a number of reasons. To begin with, the sale and promotion of the products is controlled by the retailer. The manufacturer may find itself unexpectedly inundated with e-commerce orders due to promotional activity by the retailer. The manufacturer must have systems in place which can scale rapidly to handle these surges. Additionally, these e-commerce orders usually must be labeled and packed in a certain way with the retailers branded materials. Failing to pack orders in the correct manner, or failing to meet consumer service-level requirements, can result in expensive penalties.

Companies in this situation must make a deliberate decision to either be “in” or “out” of the e-commerce business, and then backup that decision with a rapidly scalable strategy in the distribution center. “Dabbling” in e-commerce is not an option in this case. Processes and technology must work nearly perfectly right from the start.

<b>2. Manufacturers Filling e-Commerce Orders on Behalf of Retailers</b>	
Advantages	<ul style="list-style-type: none"> <li>• Promotional activity and web-storefront infrastructure are all managed by the retailer</li> <li>• E-commerce initiatives can often start with large volumes of business from the very beginning</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>• Failure to adequately prepare can leave the DC overwhelmed</li> <li>• Additional compliance mandates (special packaging, etc.) can make a hard job even harder</li> </ul>
Common Response Strategies	<ul style="list-style-type: none"> <li>• Make a deliberate decision to either support or not support e-commerce</li> <li>• Invest in rapidly scalable processes and technology to meet the demand</li> <li>• Tactics #1,2,3,4,5,6,7</li> </ul>

### Scenario #3: Pure e-Commerce Retailers

These companies have had a direct-to-consumer channel from birth. This channel may have been driven by mail-order catalog sales initially, and evolved into web-sales over time, but the basic act of filling an order in the distribution center remained the same throughout the transition. For these retailers, e-commerce is not a new challenge, but rather an integral part of their business model.

These companies likely already have a basic platform of automation in the distribution center, with the ability to efficiently piece-pick orders and pack them in large volumes. **Smaller companies** have often already invested in a basic Warehouse Management Software (WMS) system to allow the rapid picking of small orders, but frequently the efficiencies do not carry over into the packing and shipping areas. These companies may need to focus on implementing process changes and automation in the packing area to reduce labor costs here and improve throughput.

**Larger e-commerce retailers** may have highly automated distribution centers with conveyors, sorters, and automated-storage and retrieval systems. These companies often face a different sort of challenge: wave management. Large automated systems drive efficiency by facilitating the picking of huge batches of orders at once. When a small number of high priority orders need to ship out quickly, it can often be very hard to insert these into the workflow before the batch is complete. As a result, these companies frequently are forced to have artificially early order cutoff times and service levels suffer, though labor-cost-per-order may be low. These companies should consider improved wave management technology that will facilitate faster processing of high-priority order.

3. Pure e-Commerce Retailers	
Advantages	<ul style="list-style-type: none"> <li>• Ability to focus on one order profile</li> <li>• Economies of scale</li> <li>• Years of experience in filling these orders</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>• Constant innovation in web marketing is required to remain on top</li> <li>• Labor cost per order is high, with no other channels to offset this cost</li> </ul>
Common Response Strategies	<ul style="list-style-type: none"> <li>• Small/midsized companies: continue automation investment into the packing/shipping area               <ul style="list-style-type: none"> <li>○ Tactics #1,2,3,4,5,6</li> </ul> </li> <li>• Large companies: utilize wave management technology to effectively ship high priority orders, extend cutoff times               <ul style="list-style-type: none"> <li>○ Tactic #10</li> </ul> </li> </ul>



## Scenario #4: Multi-Channel Retailers

Multi-channel retailers – those with a retail or wholesale channel in addition to direct-to-consumer – require a combination of several strategies to address their e-commerce needs. Like the manufacturers in Scenario #1, they have the advantage of being able to regulate their levels of e-commerce, and make the transition into this channel more gradually. Among this group, there are a number of strategies which have been used successfully, depending on the nature of the demand.

### Fulfill from Store

This was an early strategy in response to the e-commerce shift which is still practiced by some retailers. Consumer orders are sent to the nearest retail store for fulfillment in order to reduce freight costs and improve service levels. However, in most instances, store associates are not well-trained in packing and shipping processes. Picking e-commerce orders may be viewed as an interruption to the normal day’s work and priority may not be given to making timely shipments. The customer experience may vary greatly depending on the store from which the shipment is made.

Some companies have adopted a hybrid approach which involves filling e-commerce orders from the distribution center as a matter of practice, but if sufficient inventory does not exist in the distribution center (DC) to fill the order from a local store’s inventory as a last resort. This practice allows for some centralization and control of e-commerce orders, while still leveraging the store infrastructure as the last line of defense to ensure good customer service.

### Fulfill From Dedicated e-Commerce DC

Companies with multiple robust distribution channels often choose this route if their existing distribution centers utilize highly specialized automation systems that cannot easily serve multiple order profiles. Since fulfilling direct-to-consumer orders on a large scale requires its own specialized breed of material handling system, companies may reason that it is easier to segregate this channel into dedicated distribution centers. This strategy also allows the e-commerce DCs to be strategically located near parcel carrier hubs, where later pickup times and faster deliveries may be possible. A drawback to this approach, however, is that a significant amount of redundant inventory must be carried, as each distribution center must have its own supply of SKUs and safety stock to support its channel. Inventory can be shifted from one DC to another, but not without time and cost.

### Fulfill From Multi-Channel DC

This strategy seeks to maximize the value of drawing on shared inventory for multiple channels. For retailers where a single channel may account for a disproportionate amount of business, two different distribution facilities each with a unique design may simply not be justified. Even for companies with multiple strong channels, examples exist of these companies creating several very different material handling systems all under one roof and sharing common resources like inventory, managerial staff, dock areas, and so on. This strategy is less effective for retailers with a concentration of retail stores in one region of country, but who seek to serve a broader geographic area with direct-to-consumer commerce. It may prove challenging to find a location for a distribution center that can effectively serve both channels.

## Scenario #5: Companies That Have Outsourced the e-Commerce Channel

Some companies determine that e-commerce logistics simply does not integrate well into their supply chain infrastructure, and choose to outsource this distribution to a trading partner. There are multiple variations of this scenario as well:

4. Multi-Channel Retailers	
Advantages	<ul style="list-style-type: none"> <li>• Ability to leverage economies of scale</li> <li>• Ability to use profits from established channels to fund investment in e-commerce</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>• Each channel may have very different handling requirements</li> <li>• May not be possible to leverage automation investments across multiple channels</li> <li>• May be difficult to find a geographic location that is a suitable distribution point for multiple channels</li> </ul>
Common Response Strategies	<ul style="list-style-type: none"> <li>• Fulfill from store</li> <li>• Fulfill from dedicated e-commerce DC</li> <li>• Fulfill from multi-channel DC</li> </ul>

## Outsourcing to a Vendor

As noted in Scenario #2, many retailers choose to outsource portions of their e-commerce to vendors, having them drop ship orders directly to their consumer clients. While not alleviating the need for handling direct-to-consumer shipments, a percentage of the distribution center’s volume can be reduced by using vendors in this fashion. Additionally, the retailer does not need to purchase and stock inventory in advance and can realize a real benefit on the balance sheet. Retailers choosing this strategy are often able to offer a much broader array of items to the general public, as they are not restricted to SKUs which are physically stocked in their distribution centers. Sometimes these SKUs can be offered at a lower cost, since the retailer is not burdened with the need to stock inventory and handle it multiple times.

However, retailers choosing this strategy are highly dependent on their supplier base having the capability to fill these more complex orders. Many of their suppliers may be accustomed to filling large, palletized orders to retail distribution centers, and may struggle with the ability to pick individual items and pack them. Additionally, for retailers that offer a broad selection of SKUs from multiple vendors, this strategy can lead to consumers receiving several shipments for the same order - each originating in a different location. As a result, the consumer experience can be less consistent.

## Outsourcing to a Retailer

Some retailers actually outsource their direct to consumer commerce to other competing retailers who have a more robust e-commerce infrastructure in place. This again alleviates the need for the retailer to invest in supply chain assets themselves, but puts their e-commerce program in the hands of a quasi-competitor. A notable example of this was Borders’ decision to outsource ecommerce to rival Amazon.com. This decision to outsource a fast-growing sales channel has often been cited as one of the factors contributing to that chain’s bankruptcy in 2011.

5. Companies That Have Outsourced the e-Commerce Channel	
Advantages	<ul style="list-style-type: none"> <li>• Avoid large upfront investment in technology to support e-commerce</li> <li>• Ability to partner with a larger organization and achieve economies of scale</li> <li>• Ability to optimally locate the e-commerce distribution point</li> <li>• Ability to offer greater variety of SKUs by using vendors to drop-ship</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>• Loss of control</li> <li>• Customer service is dependent on a third party entity</li> <li>• Not all outsourcing partners want to – or are capable of – offering good service</li> </ul>
Common Response Strategies	<ul style="list-style-type: none"> <li>• Utilize vendors to fill some e-commerce orders directly</li> <li>• Partner with other retailers when appropriate</li> <li>• Use a thorough selection process to identify a good e-commerce 3PL</li> </ul>



## Outsourcing to a 3PL

Many companies choose to outsource their direct-to-consumer commerce to a third-party logistics provider (3PL). This can relieve some of the complications of using vendors or other retailers to ship orders, where the fulfilling party may be less than motivated to ensure good customer service. Many 3PLs specialize in high-volume piece-picking and parcel shipping, and are able to handle these orders quickly and efficiently. In addition, a 3PL's business consists of filling orders on behalf of others, so they may be better versed in the rigors of specialized labeling and packaging. 3PL contracts can be structured around attainment of certain customer service levels, so the client is able to ensure high levels of service to the consumer. Lastly, some 3PLs have multiple distribution centers which allow a company the flexibility of utilizing different distribution points as their e-commerce ramps up.

However, not all 3PLs are created equal. Many 3PLs began life as simple public warehouses, better suited to basic pallet handling than the intensities of piece picking and packing. In addition, many smaller 3PLs have made a surprising under-investment in basic automation such as real-time warehousing and packing technology. Companies considering a 3PL should engage in a vigorous selection process to ensure that they choose a competent partner.

### Spotlight: 3PL Selection

Choosing a third-part logistics provider (3PL) can be a real challenge. Finding a 3PL with the capabilities to handle the business requirements at a competitive price requires significant research as well as site visits to inspect various providers' installations. Commonwealth Supply Chain Advisors has developed a 3PL Request for Information that includes over 150 functionality points in areas such as services offered, industry specialization, warehousing, transportation, order management, retail compliance, technology infrastructure, and location of facilities. Click [HERE](#) for assistance with choosing a 3PL.



## Scenario #6. 3PLs Specializing in e-Commerce

As noted in the previous section, a wide variety of 3PLs offer ecommerce services. Some focus exclusively in direct-to-consumer orders, while others only dabble in it to help their customers whose primary business consists of pallet or case handling. As the balance of this document will discuss, managing e-commerce distribution requires a very specific set of capabilities and enabling technology. 3PLs that offer e-commerce but do not have a well-defined roadmap for improving efficiency do their clients a disservice, and risk losing their business entirely.

Even if a 3PL does not intend to specialize in e-commerce, they will almost certainly need to offer it on some level or risk losing their core client base. Due to the unpredictability of short, two-to-three year client contracts, most 3PLs are reluctant to invest in large amounts of specialized automation that cannot be easily adapted to other clients' needs. However, a certain basic set of requirements such as real-time warehousing and an effective forward pick area must be adopted in order to have any credible e-commerce program. A handful of software vendors offer WMS systems that are tailored to the 3PL industry, with features like accessorial billing and tracking ownership of inventory. A modern, web-based WMS can also be an excellent tool to give clients real-time visibility into status of orders and workflow.

3PLs should initially be choosy about which e-commerce accounts they choose to pursue. Starting up a new account can be like driving up a cliff – there is often no gradual ramp-up period. Offering e-commerce to existing clients and gradually introducing automation may be a sound strategy for 3PLs seeking to support this type of order fulfillment.

6. 3PLs Specializing in e-Commerce	
Advantages	<ul style="list-style-type: none"> <li>• Additional revenue through accessorial billings</li> <li>• Ability to truly differentiate their service offering from less sophisticated competitors</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>• Failure to have a credible e-commerce offering can cause the loss of core business</li> <li>• Technology investment to enable e-commerce are harder to justify with short-term contracts</li> </ul>
Common Response Strategies	<ul style="list-style-type: none"> <li>• Implement basic e-commerce capabilities like WMS and effective forward-pick areas (tactics 1,2,3,4,5)</li> <li>• Start by offering e-commerce to existing clients and get established before chasing new business</li> </ul>

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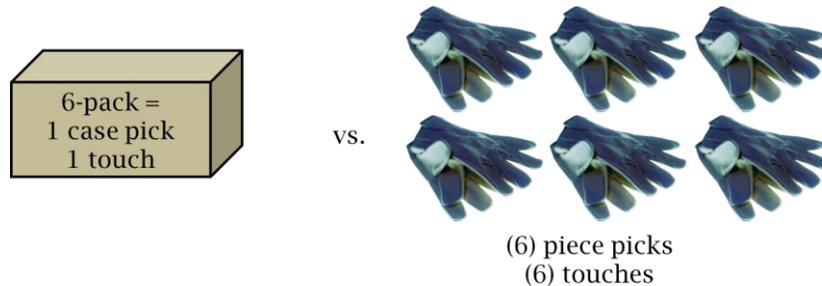
Now that we've explored the various contexts under which companies must fulfill e-commerce orders, the next section will address the reasons why these orders can present such a challenge in the distribution center.

## Why e-Commerce Distribution is So Difficult

Even for well established companies with existing distribution centers, the transition to e-commerce can be a painful one. Companies that feel the growing pains the most keenly are those whose business consists of case picking or pallet picking, with the dominant mode of transportation being Truckload or Less-than-Truckload (LTL). For these companies, e-commerce is a strange new world where the old ways of doing business no longer apply. Some of these challenges include:

### Piece-Picking – Not Case Picking

E-commerce generally requires a significantly higher level of pick labor per item than retail or wholesale channels. For retail distribution, a worker may pick a carton of six (6) pairs of gloves to be shipped to a retailer's distribution center. In the e-commerce world, the same six pairs of gloves may go out the door one at a time. Each item involves a separate trip to the bin location, a separate pick transaction, and a separate trip to bring it back to the shipping area. A six-fold increase in labor is experienced without a commensurate increase in revenue.



### Significant Pack Labor

In the wholesale/retail world, full cases of product are often picked, placed on a pallet, and then loaded on an outbound trailer, with a possible stop at a stretch-wrapping station. Direct-to-consumer commerce usually requires significant additional packing and shipping steps. A few companies are fortunate enough to be able to pick product off the shelf in a ship-ready case, but for most enterprises, the product must be over-packed in a shipping container to protect it from damage and to consolidate multiple line items. This involves erecting a corrugated carton, transferring the goods into the carton, inserting paperwork, adding void-fill material or dunnage, sealing the carton, applying a shipping label, weighing it, and sorting it to the appropriate dock door.

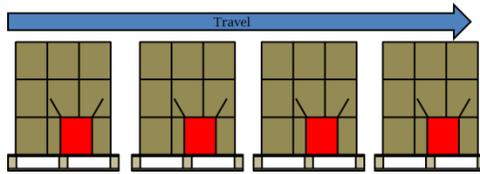


### Parcel Routing

Many companies engaged in e-commerce find themselves shipping increased amount of product via parcel carrier rather than the more familiar Truckload and LTL modes. These companies must make decisions about whether to consolidate their business with one of the two major carriers (FedEx, UPS), or to use both carriers and make intelligent decisions about which carrier has the best rates for each shipment. Newcomers will find that parcel carriers are formidable negotiators, and auditing the maze of surcharges and accessorial charges on freight bills can be a daunting endeavor.

### Pick-Faces Don't Work

Companies picking product from pallets in rack may find that opening cases and picking individual items from these rack locations is especially problematic. This method leads to extremely poor SKU density, as a worker must travel great distances to pick a handful of items. Additionally, when the remaining cases are picked from the pallet, often a broken-case residual remains which must be dealt with before a new pallet can be replaced in the bin location.



### Pick Methods Don't Work Well

Companies that are used to picking cases to a pallet often try to replicate this basic process when they begin handling e-commerce orders. The result is a messy pallet with totes stacked haphazardly on it, each tote containing a handful of small items. Only a small number of orders can be picked this way before the pallet becomes unwieldy.

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With this plethora of challenges, it is no wonder then that many companies shy away from filling e-commerce orders. However, countless companies have overcome these obstacles and are managing e-commerce profitably. The next section will explore some specific tactics that such companies are using to combat these challenges.

# Ten Tactics to Improve Success in e-Commerce Distribution

Commonwealth Supply Chain Advisors has identified ten key tactics that successful companies are employing in order to make a graceful transition to higher levels of e-commerce in the distribution center:

## Basic Tactics

1. Create a Forward Pick Area
2. Setup Effective Replenishment
  - a. Visual Replenishment
  - b. Min/Max Replenishment
  - c. Demand-Based Replenishment
  - d. Hot Replenishment
  - e. Top-Off Replenishment
3. Determine Overall Pick Strategy
  - a. Vehicle-based systems
  - b. Conveyor-based systems
  - c. Goods-to-picker systems
4. Determine the Optimal Pick Methodology
  - a. Discrete Order Picking
  - b. Cluster Picking
  - c. Zone Picking: Pick and Pass, Pick and Consolidate
  - d. Batch Picking

## Intermediate Tactics

5. Practice Real-Time Warehousing: Six categories of WMS vendors
6. Optimize Packing
  - a. Manual Packing
  - b. Specialized Packing
  - c. Semi-Automated Packing
  - d. Fully Automated Packing
7. Manage Parcel Shipments Effectively
  - a. Dynamic multi-carrier rate shopping
  - b. Parcel Invoice Auditing

## Advanced Tactics

8. Pick to Shipping Container
9. Employ Goods-to-Picker Systems
  - a. Horizontal Carousels
  - b. Vertical Carousels
  - c. Vertical Lift Modules
  - d. Automated Storage and Retrieval Systems (AS/RS)
  - e. Robotic Picking Systems
10. Improve Wave Management
  - a. A System that Can't Get Out of Its Own Way
  - b. "Waveless" Picking and Other Variations



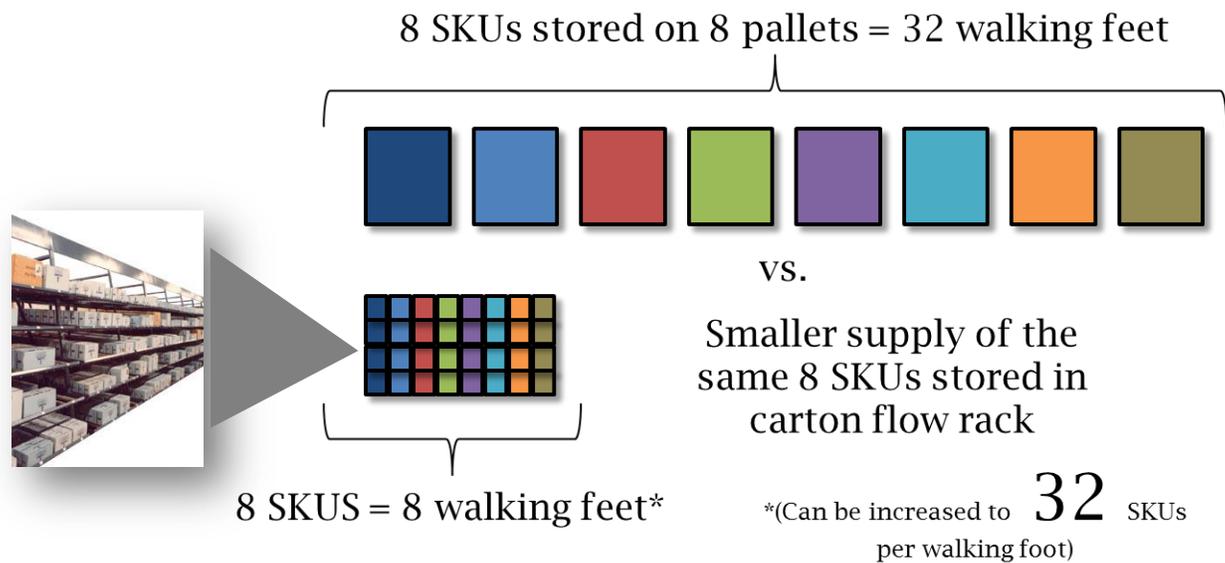
## Basic Tactics

### Tactic #1: Create a Forward Pick Area

A forward pick area is a zone in the warehouse that contains a small amount of a large number of SKUs. The goal of creating this area is to increase SKU-density per linear-foot, and allow multiple picks to be performed with a minimal amount of travel. Figure 2 illustrates the extent to which walking can be reduced by implementing this strategy.

Without a forward pick area, where unit picking is done from broken cases stored in pallet rack, a picker would need to travel 32 feet to be able to pick 8 SKUs. Because such a large amount of each SKU is stored in the pick zone (an entire pallet of each SKU), the picker must walk past large reserve supplies of product to pick a relatively small amount of goods.

*Figure 2: The concept of a forward pick area*



In a forward pick area, a small supply (one month's usage for instance) of each SKU is selected for the pick zone. Rather than being stored in pallet rack, these SKUs are stored in more suitable mediums such as carton flow rack or static shelving. In carton flow rack, for instance, approximately four (4) cartons of each SKU can be stored in a single lane of carton flow (assuming a twelve-inch square carton and 48" deep carton-flow). If the carton-flow is configured eight lanes wide by four lanes tall, then approximately 32 SKUs can be stored in eight lineal feet of aisle. This is a sixteen-fold increase in SKU density. Rather than walking thirty-two feet, the same 8 SKUs can be picked by walking eight feet.

Figure 3: Storage mediums for forward picking (left to right: shelving, carton flow, carton flow)



Image sources: Borroughs Corporation, Frazier Industrial Company

### Tips For Setting Up A Forward Pick Area

- **Don't try to put every SKU here:** Select the SKUs which are most frequently used for e-commerce. Very slow movers and very fast movers might not belong here.
- **Use the right storage medium:** Determine the optimal supply of goods to keep in this zone based on days of usage. Then determine how many cubic inches of space will be occupied by this target supply of each SKU. Once this factor is known, then appropriate storage mediums can be chosen. Items with low cubic velocity can be stored in static shelving. Medium cubic-density items can be stored in carton flow rack. Larger density items can be stored in decked pallet rack, full pallets, or even pallet-flow rack.
- **Reconfigure your WMS:** Your company's Warehouse Management Software (WMS) system will need to be configured to allow for multiple zones in the warehouse, and to direct certain types of picking to certain zones. The same SKU will likely exist in the forward pick area in a small quantity, as well as in a reserve location where a larger supply is held. If full cases of product are required for an order, the WMS will likely need to direct the picker to the reserve location rather than depleting a significant amount of product from the forward pick area. Most modern WMS systems can accommodate this, but certain legacy systems may struggle with the concept of the same SKU residing in multiple bins. Work-arounds in the WMS may need to be created to allow this bin system.
- **Re-profile frequently:** As e-commerce ramps up, the target days-on-hand for the forward pick area may need to be adjusted, and certain SKUs may need to be shifted to other storage mediums based on changing velocity. Failure to re-profile will cause efficiency gains to be eroded.

## Tactic #2: Setup Effective Replenishment

Eventually, the supply of goods in the forward pick area will be exhausted. Rather than having pickers be caught by surprise when this happens, effective rules must be set up for controlled replenishment.

### Types of Replenishment

- **A. Visual Replenishment:** This may be the only system possible with a primitive WMS system. At certain times, designated replenishment workers conduct a visual survey of each bin, and replenish the ones which are getting empty. This method can be haphazard, as additional work is required to visually survey each bin, and notations must be made as to replenishment levels. Furthermore, if demand for a SKU is exceptionally heavy, the bin may still be depleted before a replenishment can take place.
- **B. Min/Max Replenishment:** This system involves using the WMS or inventory control system to trigger a replenishment when the bin is depleted below a pre-set minimum level. To be most effective, each SKU or SKU family should have a different pre-set minimum, based on demand and cube.
- **C. Demand-Based Replenishment:** Both of the above systems are predicated on the assumption that demand will follow certain patterns. Both systems can fail to prevent a bin-level stock-out if demand is unusually heavy for certain SKUs. Demand-based replenishment proactively looks at SKU demand for a given day or shift, and preemptively triggers a replenishment for SKUs with extra-heavy demand.
- **D. Hot Replenishment:** Even the best of systems will occasionally experience an unexpected shortage due to inventory inaccuracy and other imperfections. When this happens, it is helpful if pickers can trigger an automatic replenishment of the shorted SKU to correct the problem.
- **E. Top-Off Replenishment:** At slow times during the day, bins can be proactively “topped off” to their maximum levels to get ahead of schedule. This can be done visually or with system-driven routines.

### The Importance of Replenishment Synchronization

More advanced forms of replenishment require close synchronization of work between pickers and replenishment workers. For example, decisions must be made as to what event will actually trigger a minimum-quantity replenishment. Will the replenishment be ordered at the exact moment when the bin is depleted below minimum levels? Or will the replenishment occur at

*“If the replenishment occurs before the bin is actually depleted, the new product being brought in may not fit in the designated bin.*

*If the replenishment occurs too late, then the bin may be out of product when a picker arrives.”*

the moment when an order is waved for picking which is expected to eventually deplete the bin below minimum? If the replenishment occurs before the bin is actually depleted, the new product being brought in may not fit in the designated bin. If the replenishment occurs too late, then the bin may be out of product when a picker arrives. The same situation can occur if a demand-based replenishment occurs too early.



One way of rectifying this is to allow the same SKU to have multiple locations even within the forward pick area. At the same time, a certain percentage of bins are intentionally left empty when this area is slotted. If a replenishment is performed which will over-fill the primary bin, then the product is instead deposited in an empty bin, which becomes a secondary location for that SKU. The original primary location can then be picked to empty, and is added to the queue of available bins.

#### A Word of Caution

Many WMS systems struggle mightily with the concept of multiple locations for the same SKU in a single zone, and cannot manage the replenishment logic. A simple method for dealing with bin overages is to simply have an informal area either overhead or on the floor adjacent to the bins to allow overflow product to be placed. The WMS “thinks” the product is all in the primary pick location, but pickers must be alert to check these overflow areas for product from time to time.

### Tactic #3: Determine Overall Pick Strategy

The decision of an overall pick strategy should not be taken lightly. Companies that are in their infancy with e-commerce will likely not have the piece-pick volumes to justify expensive material handling equipment. It is advisable, however, to perform some long range planning and have some sense of what strategy will need to be employed once volumes increase.

There are three fundamental pick strategies which companies can employ:

#### Vehicle-Based Systems

Many companies may already be performing this type of picking. They may be using electric pallet-jacks for floor-level picking or “man-up” order-pickers for multi-level picking. As discussed before, neither of these vehicles lends itself particularly well to picking low-cube items to discrete orders. Manual picking carts, while not likely to win any technological awards, are the lynchpin of many piece-pick distribution centers, even those with high volumes of business. A key to effective cart picking is using the right cart design. There are seemingly infinite configurations of shelves to suit every picking need. It may be wise to purchase a few different designs as “prototypes” to test out in the warehouse before making a larger purchase.



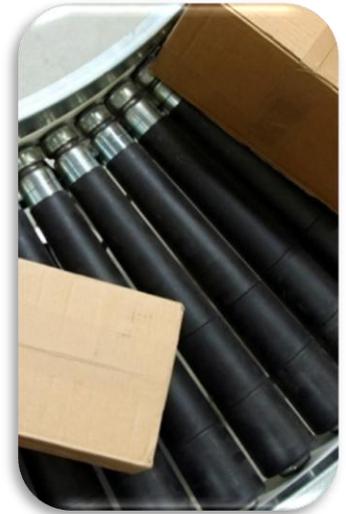
Image source: Grainger

A. Vehicle Based Picking	
Advantages	<ul style="list-style-type: none"><li>• Inexpensive</li><li>• Flexible</li><li>• Easy to add additional labor at peak periods</li></ul>
Disadvantages	<ul style="list-style-type: none"><li>• Potential ergonomic issues</li><li>• Passing batches between zones is harder than with conveyors</li><li>• May be long travel distances to packing area</li></ul>

### Conveyor-Based Systems

For large distribution centers with multiple pick zones, conveyor-based systems can be an effective means of fulfilling orders. When goods need to be conveyed a long distance to a shipping area, or when they must be routed to many different zones for picks by a variety of workers, conveyors can be a significant labor saver. Conveyor systems are not inexpensive however, and careful thought must go into their design. Systems should be designed with scalability in mind. Additional levels of a pick module might need to be added in the future, and the support structure should be designed to support this if needed. Generally speaking, conveyor-based systems evolve relatively well over time. Additional labor can usually be added fairly easily, and the system can be lengthened or additional levels can be added in the future.

Even if a company does not feel that they need a conveyor-based picking system now, they should expect that they will likely need such a system in the future if e-commerce levels grow. Doing some preliminary layouts to determine where this system might be installed will allow a cart-based system to be implemented today that can easily evolve into a conveyor-based system tomorrow without costly reconfiguration.



B. Conveyor-Based Picking	
Advantages	<ul style="list-style-type: none"><li>• Well suited for large distribution centers with multiple zones</li><li>• Ties into automated packing systems well</li><li>• Operators can focus on picking, not transporting</li><li>• Can usually add labor in peak periods</li></ul>
Disadvantages	<ul style="list-style-type: none"><li>• High upfront cost</li><li>• Less flexible than carts</li><li>• Not all SKUs are conveyable</li></ul>

### Goods-to-Picker Systems

There are a wide variety of goods to picker systems available, including vertical and horizontal carousels, vertical lift modules, automated storage & retrieval systems (AS/RS), and robotic picking systems. Each has their relative merits, depending on the type of goods being picked and the outbound velocity patterns. Goods-to-picker systems offer the fastest pick rates of all three picking strategies, but are also the least flexible if business needs change. A potential middle ground exists now with advent of robotic picking systems. These systems involve armies of robots bringing shelving pods to pickers and then putting them away again after picking is done. Tactic #9 will discuss each type of goods-to-picker system in more detail.



*Horizontal carousel  
Image source: Kardex Remstar*

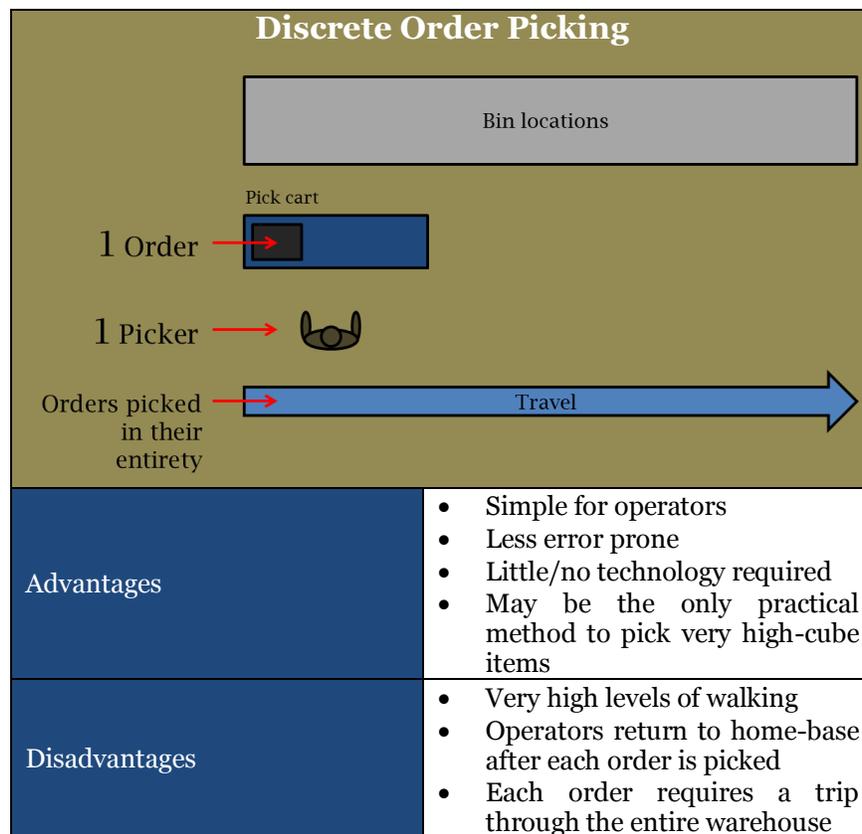
C. Goods-to-Picker Systems	
Advantages	<ul style="list-style-type: none"><li>• Ultra-high pick rates</li><li>• Excellent space utilization</li></ul>
Disadvantages	<ul style="list-style-type: none"><li>• High upfront cost</li><li>• Very inflexible if needs change</li><li>• System efficiency is highly dependent on the capabilities of the software controlling it</li></ul>

## Tactic #4: Determine Optimal Pick Methodology

Once the pick strategy has been determined, attention can be turned to pick *methodology*. There are many confusing terms for different types of picking, and there is not a universally accepted definition for some of them. This section will define several of the major types of picking and discuss the pros and cons of each.

### Discrete Order Picking

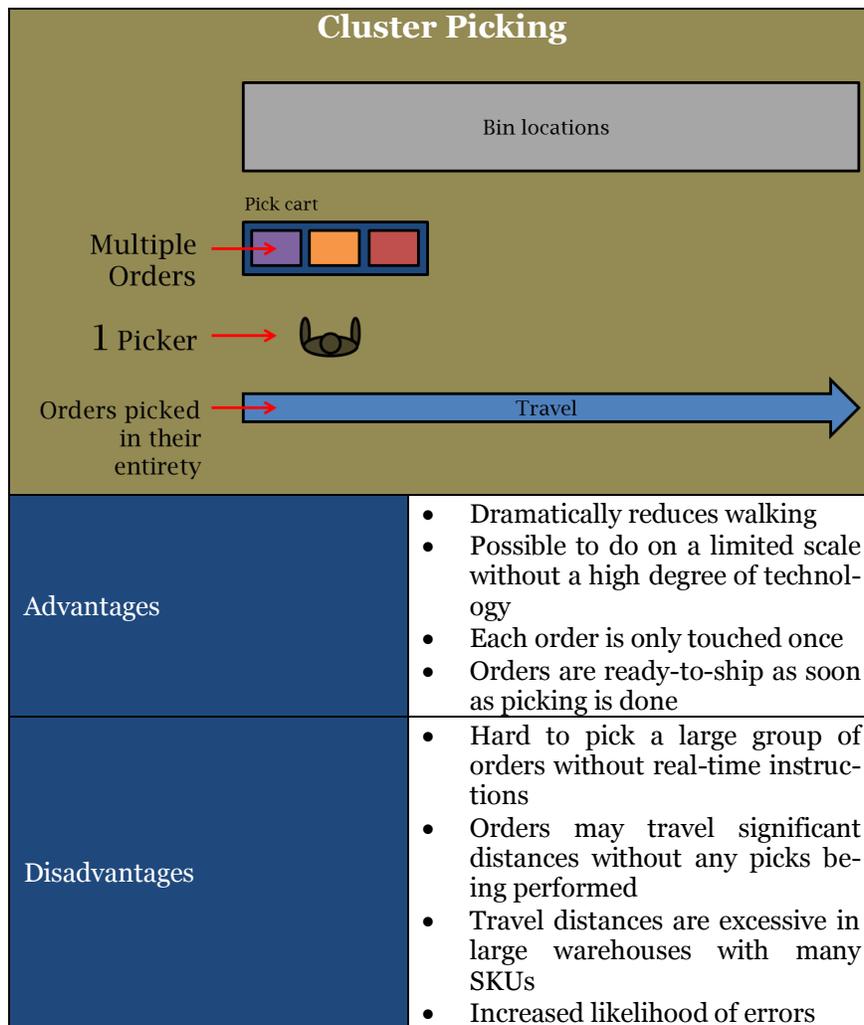
With this method, one order at a time is picked, start-to-finish, by one picker. Without a WMS system, this may be the only method of picking that can be practically executed in some distribution centers. Discrete order picking is simple to learn and not very prone to error. For companies used to picking large-cube orders, this method may be very effective; there simply may not be a good way for a picker to transport more than one order around the warehouse at a given time. However, discrete order picking is colossally inefficient for small cube item picking. To pick five orders, each of which might fit in the size of a shoe box, a worker must make five separate trips around the entire warehouse. Walking is excessive, and labor costs are as well.



## Cluster Picking

Moving from discrete order picking to cluster picking is one of the single greatest leaps forward in efficiency that a company can take in the distribution center. With cluster picking, multiple orders at a time are picked, start-to-finish, by one picker. As the orders are picked, they are placed in discrete, separate containers. In the analogy mentioned previously, the same five orders now involve only a single trip through the distribution center. Cluster picking is much easier with a real-time warehousing system where pickers are directed in an efficient pick path, and are told exactly what to pick and where to put it. However, good results are still attainable with paper-based systems, using batch pick-tickets. Paper-based cluster picking is certainly more error prone than discrete order picking, so if automatic data capture like bar-code scanning is not used to ensure accuracy, then secondary checking will need to be employed.

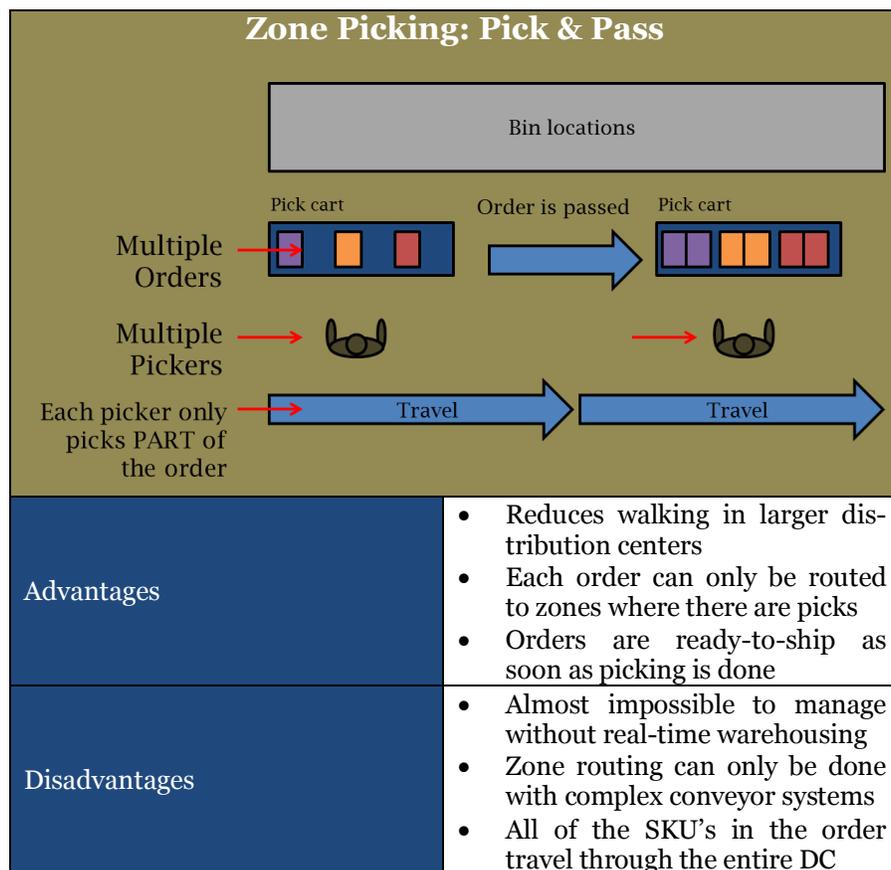
*“Moving from discrete order picking to cluster picking is one of the single greatest leaps forward in efficiency that a company can take in the distribution center.”*



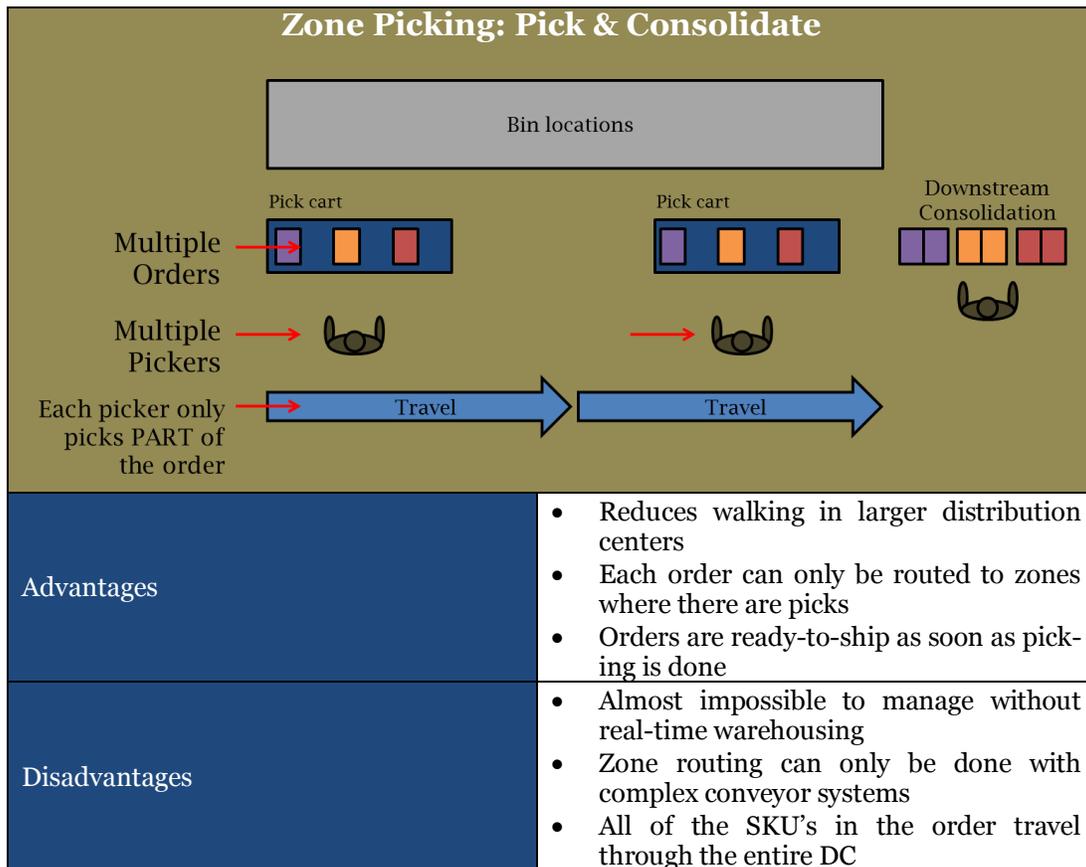
## Zone Picking

Zone picking involves multiple pickers each picking separate portions of the same order. It is often deployed in conjunction with cluster picking, where multiple pickers each pick separate parts of multiple orders at the same time. Zone picking works best when there are a variety of types of SKUs or very large SKU sets that orders can be drawn from. There are two flavors of zone picking:

- **Pick-and-Pass**, or sequential zone picking, involves one picker “passing” a group of orders to another picker who then performs additional picks for the same orders. The product is still placed in a discrete tote or carton that is handed off to multiple picks in sequence until the order is picked to completion. Pick and pass can be used with cart-based picking (the entire cart is passed to the next picker) or with conveyor-based picking. With the latter strategy, more complex zone routing can be employed, where totes can skip over zones where there are no picks for maximum efficiency. Zone picking must almost always be deployed with a real-time warehousing system.

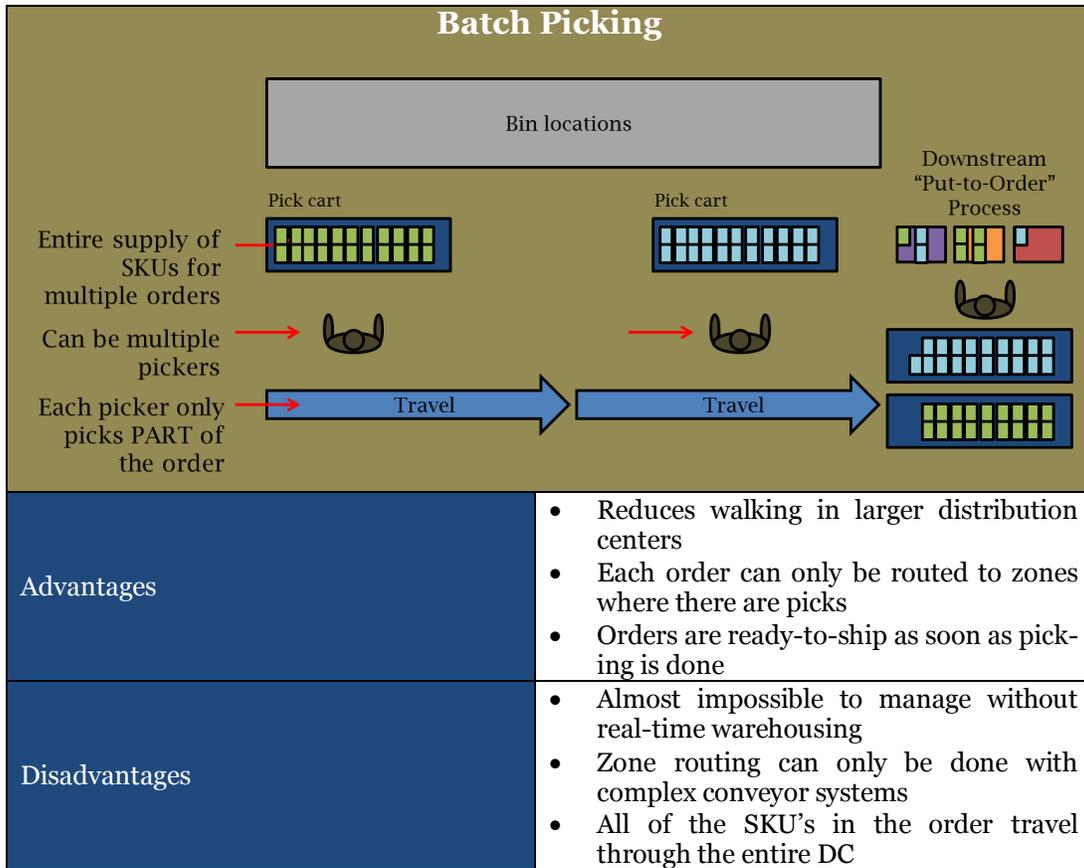


- **Pick-and-Consolidate**, or simultaneous zone picking, involves multiple pickers picking parts of the same orders at the same time. The items are picked into discrete totes which must then be married up or consolidated in a secondary process downstream. This method is well suited for situations where the total cube of an order is fairly large, or where there is a wide disparity in characteristics amongst the various SKUs in an order. For example, there may be some large, non-conveyable items on an order along with smaller conveyable items. Each type of SKU would be picked in its own zone and the entire order would be married up at the end of the process.



**Batch Picking**

Batch picking involves picking the entire quantity of a SKU which is required for multiple orders, and then sorting it to those individual orders in a secondary process. Batch picking works best in a “few-to-many” environment, when there are a small number of very fast moving SKUs which are required for a large number of orders. For instance, a picker may pick an entire pallet of product, bring it to a sorting area, and then perform a “put” process and distribute the items to each of the outbound orders. Batch picking can be used in conjunction with other forms of picking as well. For example, a picker can perform a cluster pick – picking ten orders simultaneously into discrete containers – and then drop those orders at a “put” station where a few fast moving SKUs are put to the orders.



## Intermediate Tactics

### Tactic #5: Practice Real-Time Warehousing

As the complexity of a company's pick methodology increase, the need for a real-time warehousing system to direct and confirm the execution of these picks becomes more and more important. While discrete order picking, and very basic cluster picking can be managed with paper-based pick tickets, high-volume cluster picking, zone picking, and batch picking almost always require the use of a Warehouse Management Software (WMS) system to administer.

Wireless, mobile devices are the backbone of a WMS system. These devices generally feature a small computer screen where workers receive instructions, a bar-code scanner where workers can confirm that they have properly executed those instructions, and an alpha-numeric keypad to enter additional pieces of information.

WMS systems serve several critical functions in the distribution center:

- Organization of work
- Task direction
- Transaction confirmation
- Real-time location tracking
- Elimination of redundant data entry

WMS systems are usually cost justified by the labor savings they enable. For instance, labor requirements can be drastically reduced when companies transition from discrete order picking to cluster picking. This labor can be redeployed to other areas of the operation where it can be better utilized.

As with most forms of technology, one size does not fit all. There are over 100 different providers of Warehouse Management Software in the marketplace today, each with their own set of strengths and weaknesses. Careful attention should be given to the selection of a WMS provider. Decisions made here will have implications for years to come in terms of functionality which can be enabled in the distribution center, and the level of technical resources required to support and maintain the system.

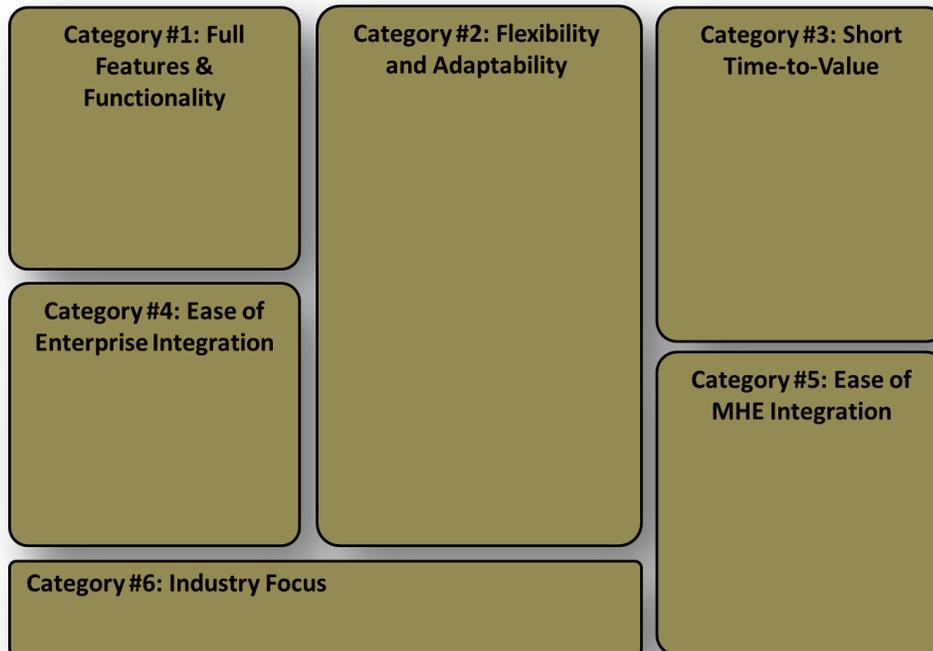


*Image source: Intermec*

## Six categories of WMS vendors

Commonwealth divides the WMS provider community into six categories:

- Category #1: Full Features & Functionality
- Category #2: Flexibility and Adaptability
- Category #3: Short Time-to-Value
- Category #4: Ease of Enterprise Integration
- Category #5: Ease of MHE Integration
- Category #6: Industry Focus



Properly implementing a WMS system can take a year or more. Generally, companies should allow the following amounts of time for this initiative:

- Distribution Optimization: 3 - 6 months
- WMS Vendor Selection: 2 - 4 months
- WMS Implementation: 6 - 12 months

It is worth noting that for very simple operations without a lot of process complexity, WMS implementation time can be drastically shortened, to as little as two months. More companies are offering WMS in the Software-as-a-Service (SaaS) model which can facilitate shorter implementation times as well.

### Spotlight: WMS Selection

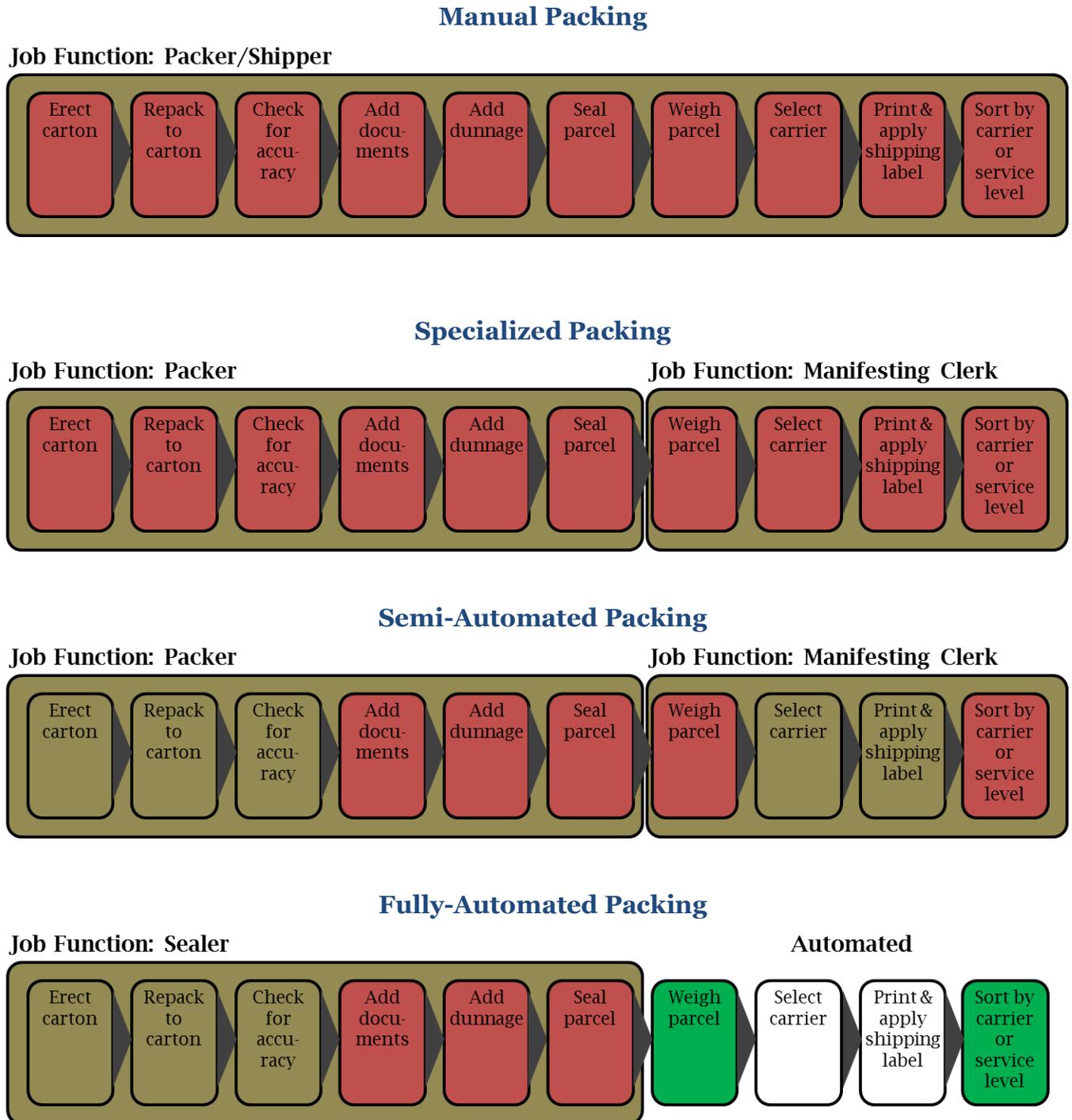
Commonwealth Supply Chain Advisors has developed a WMS Request for Information form that includes over 3,460 data points in areas such as corporate structure, functionality and technical architecture. Commonwealth's well-regarded WMS selection methodology was recently profiled in a report by the AberdeenGroup titled, "An OBJECTIVE Guide to Selecting a WMS". Click [HERE](#) to receive a copy of this report.

## Tactic #6: Optimize Packing

Perhaps the biggest area of inefficiency that still remains when distribution centers convert to higher levels of e-commerce lies in the packing operation. Packing requirements often creep up over time, and since the evolution is gradual, companies often initially address the needs with manual processes that simply proliferate as volumes increase.

There are four levels of packing automation which companies often go through in their evolution (Figure 4):

**Figure 4: Evolution of Packing Methodology: From Manual to Fully Automated**



### *Manual Packing*

In manual packing environments, large pack stations are utilized, each staffed by a worker who performs all of the various packing and shipping functions themselves. While having a greater breadth of ability, this worker usually becomes a “jack of all trades”, and is unable to execute the packing process in a very efficient manner.

As Figure 4 indicates, there are as many as ten (10) steps in a packing process, and it takes a very talented worker to master all of these and be able to rapidly transition from one diverse task to another. Carton erection, order checking, dunnage & sealing, manifesting, and label printing require a highly specialized skill set. Having a single worker perform all of these functions does not lend itself well to economies of scale.

Additionally, with manual packing, each packing station must have a significant amount of equipment and supplies: stacks of knocked-down corrugate, case sealing devices, dunnage machines, bar-code scanners, parcel weigh-scales, label printers, and other devices. The cost of acquiring and maintaining all of this equipment can be high.

Manual packing is often practiced in non-real-time warehousing environments, where the absence of bar-code scanning at picking necessitates a secondary checking process during packing. This amounts to significant additional labor requirements, as well as additional scanning equipment and computer terminals at each packing station. The job requirements for the packing role also increase to a higher level of sophistication than would otherwise be required.

Even within the realm of Manual Packing, however, it is possible to make simple changes which can lead to process improvements. For example, one often-overlooked device in this area is the automatic tape dispenser. These units can be programmed to dispense a specific length of tape that is suited to the size carton being used. Operators push one button, and a piece of tape is quickly fed out of the machine, and applied to the parcel. Pack times are reduced as is tape consumption.



*Tape dispenser  
Image source: Betterpack*

### *Specialized Packing*

A natural evolution towards greater packing efficiency involves a simple division of labor into two basic roles: (a) packer and (b) manifesting clerk. In this way, the more manual aspects of packing (case erection, sealing, etc.) can be performed by workers with those skill sets, and the more information-oriented function of manifesting can be performed by another worker. Expensive equipment like scales and printers can be isolated to just the manifesting function, and overall cost can often be reduced.

### *Semi-Automated Packing*

Semi-automated packing actually reduces a number of the packing steps by utilizing a “pick to shipping container” process. While Tactic #8 will discuss how this functionality can be achieved in more detail, migrating to this operating method can produce real savings.

Case erection is performed en masse prior to order picking, sometimes using automated carton erectors. Ideally, the parcel carrier should also be selected prior to picking. This is usually possible if a good database exists of unit weights to enable effective multi-carrier rate shopping. Once the carrier is chosen, the shipping label is applied to the carton and serves as a “carton ID label” for the life of the order in the distribution center. Two very tedious functions – carton erection and label application – can be converted to repetitive, assembly-line style functions.

Picking to the shipping container is usually only practical where real-time warehousing is used, and the pick transaction can be confirmed with a bar-code scan at the time of pick; this eliminates the need for a labor-intense secondary check at packing.

During the picking process, units are picked and placed directly in the appropriate shipping container, eliminating the need for extra handling at packing. The packing function is reduced to adding documents and dunnage, and case seal. The manifesting function is reduced to a simple weight verification and sortation by carrier.

### *Fully Automated Packing*

Fully automated packing involves the use of three pieces of equipment to round out the packing and shipping process (Figure 5):

- Case sealers
- In-motion weigh scales
- Sortation technology

This equipment must, of course, be tied together with a well-designed conveyor system with an appropriate amount of accumulation capacity.

*Figure 5: Packing Equipment*

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*Case Sealer*  
*Image source: 3M*



*In-Motion Scale*  
*Image source: Mettler-Toledo*



*Printer-Applicator*  
*Image source: Weber*

The only function where manual labor is still required is in the addition of dunnage or void-fill material. This function can be very difficult to fully automate and is usually still imperfect at best. Because an operator is still required at a dunnage station, many companies elect to not invest in fully automated case seal technology. Less-expensive semi-automated seal-

ing equipment requires an operator to guide the carton into the in-feed of the sealing unit – a simple task for the dunnage operator to perform.

If the shipping label is not applied at the beginning of the process (prior to picking) for some reason, this function can also be automated through printer-applicator technology.

### Spotlight: WCS

Managing the various devices required for fully automated packing can sometimes be challenging. If shipping label application is to be performed during packing, it is especially important for data transmission speeds to be fast. Some companies have found that the use of a Warehouse Control Software (WCS) system simplifies device management and facilitates greater communication speed. Architecturally, a WCS sits between the WMS and the machine level controls for the conveyor, weight scale, printer-applicator, and any sortation equipment that is used.

## Tactic #7: Manage Parcel Shipments Effectively

With increased e-commerce come increased levels of parcel shipments. The choice of parcel carriers in the United States is generally limited to two main providers: UPS and FedEx, with some shipment profiles also lending themselves well to the United States Postal Service (USPS). Among shippers, the choice of which carriers to use is almost a religious debate. For every shipper with a strong preference for one carrier, there is another shipper with the same preference about the opposite carrier. Horror stories abound about “the time we switched to the ‘other’ carrier”, and why we switched back.

Part of the reason for such differing opinions often comes down to the strength or weakness of the shipping manager’s relationship with the parcel carrier’s local account manager. The speed with which a carrier acts to resolve problems, and the perceived level of attention from the carrier, often factor heavily into a shipper’s choice. Additionally, shippers may go for long periods of time without aggressively renegotiating rates. Then, when they introduce the competing carrier and give them an opportunity to bid for the business, the new carrier submits extremely aggressive rates in an attempt to unseat the incumbent. This can lead to the perception that the shipper had been taken advantage of by the incumbent carrier. In reality, both major parcel carriers tend to get complacent when a shipper does not aggressively negotiate for better rates on a regular basis.

### *Dynamic Multi-Carrier Rate Shopping*

To effectively deal with this oligopoly, Commonwealth often recommends that shippers divide their shipments between UPS and FedEx, rather than giving one carrier all of the business. This forces both carriers to constantly be “on their toes” to offer competitive discounts, and allows shippers to determine the best carrier for each parcel on a shipment-by-shipment basis. To do this effectively requires the use of multi-carrier manifesting software. Rather than having separate computer terminals for both UPS and FedEx manifesting, these systems allow each parcel to be quickly shopped against rates from both carriers (and the USPS in many cases), and select the lowest cost provider based on the shipment characteristics, destination, and service level required. In a matter of seconds after weight capture, the appropriate carrier can be selected and a shipping label can be printed, from one terminal and one label printer. Manifesting software can interface with the WMS or ERP systems to receive shipment data and transmit tracking numbers and other data in a timely fashion. Multi-carrier rate shopping can reduce freight spend, improve manifesting efficiency, and reduce the number of terminals and other hardware required on the warehouse floor.



### Parcel Invoice Auditing

In addition to making effective carrier-selection decisions up-front, it is just as important for companies to carefully audit their parcel invoices after the fact. For many firms, this is a daunting challenge. Parcel bills are complex by their very nature. In addition to ensuring that the correct rates and discounts have been charged, a single parcel shipment can have a maze of confusing accessorial charges attached to it, which may or may not be valid. Duplicate shipments may be invoiced. The guaranteed service level may not have been met by the carrier. Proper auditing involves at least 34 points of validation on each shipment (Figure 6).

Figure 6: 34 Points to Audit

Parcel Invoice Auditing Points		
1. Incorrect Rate or Discount	13. Inaccurately Billed Collect Shipments	25. Saturday Delivery and Pick-up Validation
2. Incorrect Accessorial Charges	14. Inaccurately Billed 3rd Party Shipments	26. Early A.M. Deliveries
3. Late Deliveries (GSRs)	15. Duplicate Invoice	27. Invalid Account Number Usage
4. Dimensional Weight Errors (DIMS/SCC)	16. Duplicate Tracking Number	28. Returned Service Labels not used
5. Manifested but Not Shipped (Voids)	17. Inactive Account Reporting	29. Additional Handling Charges
6. Address Corrections	18. Multiple Account Validation	30. No Proof of Delivery
7. Commercial/Residential Adjustments	19. Declared Value (Insurance)	31. Special Contract Consideration
8. Delivery Area Surcharge (DAS/Rural)	20. C.O.D.s	32. Packages Not Previously Billed
9. Extended Commercial/Residential DAS	21. Undeliverable Returns	33. Chargebacks
10. Fuel Surcharge	22. Weight Accuracy	34. All Miscellaneous Charges
11. Minimum Net Charge	23. Large Package Surcharge	
12. International Import and Export	24. Late Payment Fee Visibility	

### Spotlight: 3<sup>rd</sup> Party Auditing

Companies that have invested time into a meticulous auditing process generally find that they are able to uncover a surprising number of errors and recover no small amount of funds. However, the act of checking each of these 34 points can be a never-ending task that consumes a tremendous amount of administrative resources. Many companies choose to outsource this function to a 3<sup>rd</sup> party auditing firm that specializes in parcel billing. These firms often work on a contingency basis, and only bill their clients for a percentage of the funds they are able to recover. Click [HERE](#) to learn more about 3<sup>rd</sup>-Party auditing.

## Advanced Tactics

Image source: Tetris

### Tactic #8: Pick-to-Shipping-Container

As discussed in Tactic #6, picking to the shipping container can greatly reduce handling requirements in the packing area. In order to execute on a strategy like this, there are several pre-requisites:

1. Accurate product dimensions and weight must exist
2. Scan-verification at time of picking must take place
3. A cartonization system must be used to calculate the correct size shipping container
4. A capable WMS system must be in use

#### Product Dimensions

For companies with a large number of SKUs available for e-commerce orders, capturing the measurements of each item can seem like a daunting task. However, automatic cubing devices can greatly speed this process. An automatic cubing device uses ultrasonic technology to ascertain the dimensions of an item. An operator places the item on the cubing device, presses a button, and within seconds, the length, width, height, and weight of the item are captured. A SKU number is entered (or scanned from a bar-code), and the information is recorded in a database.

Using this technology can be a fast and accurate way to capture cubic dimensions of items. A variety of such devices are available, so companies should choose carefully. Minimum and maximum product size plays a role in device selection, as does the frequency of irregular parts (items that are not shaped like a rectangle). Cubing devices can usually be purchased or rented for short term engagements.

In high-inventory-turn environments, many companies find that an effective approach to cubing is to capture the cube of all inbound product at receipt, when it must be handled anyway. Then, after the bulk of the SKUs have been cubed, the remaining items are cubed as needed by selecting them from their bin locations.

Even with cubing technology, the effort is still very labor-intensive, as ultimately, each SKU in the DC must be handled. In view of this, careful planning should go into the effort to ensure that all of the necessary data is collected. It is vital to distinguish between different pack sizes of the same item. For example, an item may come in a pack size of three. It is important to know if the unit of sale in this case is one or three. If the saleable unit is at the “each” level, then the box must be opened and the individual unit cubed. If the unit is sold in multiple pack sizes, it can be helpful to capture each individual pack size separately. In some cases, vendors may be able to provide data on product dimensions, but the same care must be exercised to ensure that the pack-size issues are communicated properly.

Although time-consuming, gathering cube data can be extremely useful for a number of distribution initiatives, including:

- Picking to the shipping container
- Slotting
- System-directed put-away
- Check-weighing
- Pre-manifesting

### Tactic #9: Employ Goods-to-Picker Systems

Eventually, if piece-pick requirements increase to a certain level, then goods-to-picker systems may make sense as a means of reducing pick labor (and improving space utilization). While good cart-based systems can produce pick rates of between 100 and 200 lines per hour, goods-to-picker systems have been known to allow rates of 400 – 600 lines per hour.



Goods-to-picker systems are available as many different forms of technology. A company's choice of system should be driven by:

- Throughput requirements
- Product makeup
- Order profiles
- Space requirements
- Budgetary limitations
- Flexibility needs

Some of the major forms of goods-to-picker systems are listed below:

### **Horizontal Carousels**

These systems produce very high pick rates but are not as space-effective as other technologies. Creative use of mezzanines and lift tables can extend the working height of these systems and make better use of cube. Successful horizontal carousel systems require that multiple units be grouped in a pod, where a single picker works multiple machines at the same time. This necessitates the use of sophisticated software to plan and execute each batch of orders that are picked. Unfortunately, over the last several decades, the mechanical designs of horizontal carousels evolved at a faster rate than the requisite software capabilities, and as a result many horizontal carousel systems were installed in the 1980's and 1990's which failed to meet expectations. Some supply chain executives have a bad taste in their mouths from this situation; these individuals can take comfort in the improved software capabilities which have arisen in recent years. There are many, many examples of successful systems in a wide variety of industries.



*Horizontal carousels  
Image source: Kardex Remstar*



*Vertical carousels  
Image source: System Logistics*

### **Vertical Carousels**

Vertical carousels typically do not produce the same high pick rates as their horizontal cousins, but can still often exceed rates from cart-based systems. Vertical carousels excel in when space utilization is the dominant design factor. The full height of a building can be typically utilized for storage while the picker remains on the floor level. Like horizontal carousels, software and system design are key to ensure that operators can pick from multiple units at the same time. It is also important that the parts stored in vertical carousels be somewhat uniform in size and height.

### **Vertical Lift Modules**

From the outside, Vertical Lift Modules (VLMs) appear very similar to vertical carousels, but their operation is very different. A big advantage that VLMs have in this case is their ability to accept items of varying sizes and heights. VLMs are not quite as space efficient as vertical carousels due to the large extractor shaft in the center of the unit as well as lost space from the access window, but these disadvantages start to lessen as storage heights increase. Like vertical carousels, VLMs should be considered in areas which are space-constrained.

### *Automated Storage and Retrieval Systems (AS/RS)*

AS/RS is an entire category of its own, comprised of a variety of products which each work slightly differently. The major categories include pallet-handling and case-handling systems, with many varieties even within these categorizations. Common characteristics involve an extractor device of some kind retrieving a load and bringing it to an operator for picking.



*AS/RS*  
Image source: System Logistics

### *Robotic Picking Systems*

These systems first appeared on the scene in the mid 2000's. As of this writing, there is only a single company, Kiva Systems, with a credible track record of successful installations in this space. The Kiva system involves an army of robots which transport sections of shelving to a picker who works from a fixed location. Pick rates are comparable to those of horizontal carousels or AS/RS systems, but the big advantage of this product is its flexibility. Nothing is bolted down – the system can be easily scaled and reconfigured as business needs change. Conversely, a drawback of having nothing bolted down is that storage heights are limited to the height at which an operator can comfortably pick from the floor. Space utilization is sub-optimal with robotic picking systems.



*Robotic Picking Systems*  
Image source: Kiva Systems

## Tactic #10: Improve Wave Management

### A System that Can't Get Out of its Own Way

The aforementioned forms of material handling automation can create tremendous labor savings in the order picking process, largely through the creation of very large pick waves. Rather than accessing the same pick face several hundred times to pick a fast moving item, the entire supply of that item may be picked at one time and then separated by order using either a manual put-to-store process, or automated unit sortation technology such as a tilt-tray, cross belt, or bomb-bay sorters. These processes and technologies can contribute to ultra-high pick rates, but can sometimes create an unintended consequence.

Cluster picking and batch picking work best when a large pool of orders is built and combined into a pick wave. These large waves can take a long time to pick – sometimes several hours. This can have an impact on a company's order cutoff time – the latest time a consumer can place and order and expect it to ship the same day it is placed. Order cutoff time is a function of the parcel carrier's last pickup time, and the total order processing time. With a four-hour wave-pick processing time and a parcel pickup time of 7:00 PM, a company must have an order cutoff time of around 1:30 PM.

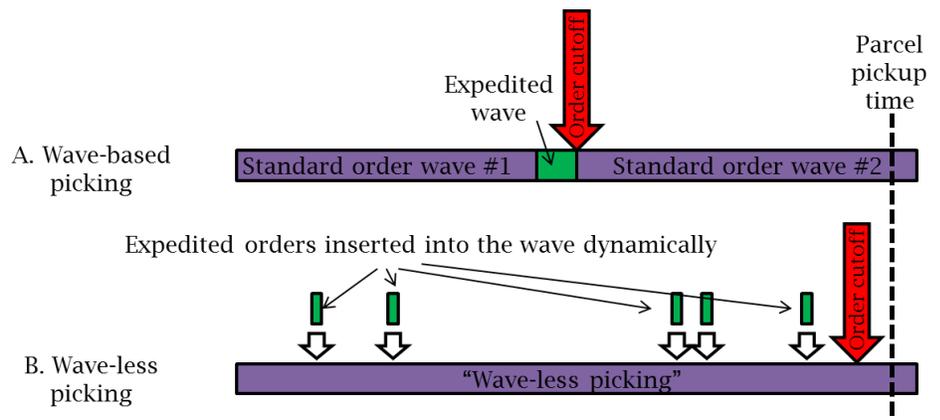
	Duration	Time
Last parcel pickup:		7:00:00 PM
Packing and shipping time:	1:30	5:30:00 PM
Wave pick processing time:	4:00	1:30:00 PM
Order cutoff time:		1:30:00 PM

By having such an early cut-off time, a company may place itself at a disadvantage compared to its competitors who may be smaller in size but able to offer later cutoffs. Furthermore, they may miss an additional opportunity to up sell consumers by offering faster service for an expediting fee. If the company had a way to quickly process a smaller percentage of orders and pick them faster, the company might be able to offer later cutoff times for those orders where an additional fee is paid, but keep the same standard cutoff time for non-expedited orders. The challenge with this strategy in a highly automated system is that in many cases, the entire large pick wave must first be processed before any additional orders can be processed.

### "Wave-less" Picking and Other Variations

In recent years, advances in wave management have allowed for the ability to dynamically insert high-priority orders into a large wave without having to wait for wave completion. This capability is sometimes referred to as "wave-less" picking, since the traditional concept of a pick wave is altered considerably with this approach. It should be pointed out that with this concept, the benefits of picking in large waves – grouping similar orders together and picking SKUs in bulk – are still preserved. However, a much greater level of flexibility is available to allow orders to be prioritized on the fly without waiting for a wave to complete. There are also overall efficiency benefits, as the wave ramp-up and ramp-down periods – with accompanying productivity declines – can be smoothed out.

This concept has been largely pioneered by developers of warehouse control software (WCS). This software acts as middleware between a WMS and the machine-level controls of the material handling system. It manages the orders in a particular wave and directs the picking process and manages the material handling equipment (MHE). This capability – while not inexpensive - can sometimes be implemented without replacing either the MHE or WMS in the distribution center.



## In Conclusion

The proliferation of e-commerce affects all companies in the consumer goods supply chain, whether they are large or small, manufacturers or retailers. Even if a manufacturer has not chosen to develop their own e-commerce channel, they may be driven into the fray by having to fulfill e-commerce orders on behalf of their retail customers.

Whatever situation a company finds themselves in with respects to e-commerce, a well-thought-out strategy is the best way to be prepared and to have a credible, scalable distribution plan for this channel. Even if direct-to-consumer orders are a small percentage of volume today, Commonwealth recommends that companies develop a master distribution roadmap which examines the critical breakpoints at which technology like WMS and goods-to-shipper systems may make sense. Even if a company does not envision any immediate changes beyond simply creating a forward pick area, this layout change should still be done in the context of the broader plan. If within the next several years the company envisions enough e-commerce to justify a conveyor-based picking system, a company should have at least some idea of how this system would fit into the overall distribution center layout. Controlled, phased changes are far preferable to the pain of a “rip and replace” project.

With proper foresight and the courage to take the first few steps, companies can embrace e-commerce as a competitive differentiator that can drive higher profits and ensure that the enterprise is well positioned for the future.



## How Commonwealth Can Help

Commonwealth Supply Chain Advisors is an independent consulting firm that helps companies measure their supply chain performance and provides guidance for how to improve it. We are not affiliated in any way with supply chain software providers, material handling equipment manufacturers, freight brokers, or carriers.

Commonwealth takes an unbiased approach to supply chain improvement, and helps companies determine whether the path to improvement lies through optimized processes, supply chain technology, logistics outsourcing, or some combination of the three.

Some of the distribution-related services that Commonwealth offers include:

- *e-Commerce Distribution Conversion*
- *Distribution Center Design*
- *Space Utilization Analysis*
- *Distribution Process Optimization*
- *Warehouse Management Software (WMS) Selection & Implementation*
- *Slotting Analysis*
- *Material Handling System Design*
- *Supply Chain Network Optimization*
- *Transportation Management Strategy*

Please feel free to contact Commonwealth if any of the above services would be of value to your company at this time!



## About the Author



**Ian Hobkirk** is the founder and Managing Director of Commonwealth Supply Chain Advisors. Over his 18-year career, he has helped hundreds of companies reduce their distribution labor costs, improve space utilization, and meet their customer service objectives. He has formed supply chain consulting organizations for two different systems integration firms, and managed the supply chain execution practice at The AberdeenGroup, a leading technology analyst firm. His career has provided him with a broad perspective on how to solve supply chain problems without automatically resorting to expensive technology. Mr. Hobkirk has authored dozens of white papers on supply chain topics, and his opinions have been featured in publications such as DC Velocity, Modern Materials Handling, and The Journal of Commerce.

His company, Commonwealth Supply Chain Advisors is a completely independent consulting firm that does not sell technology solutions.