Creating Successful Order Picking & Fulfillment

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Implementing, upgrading or improving your order picking system and processes in six steps…

Introduction |

Organizations are striving daily to do more with less and improve efficiencies. These improving efficiencies allow organizations to not only prosper and drive profitability, but to also increase their customer satisfaction levels by providing the best customer experience. Imagine being the first (or doing it the best) in your business sector to offer free same day or next day delivery, free shipping, hassle free returns, never an inventory shortage and more… this customer experience can be made by optimizing and driving cost effective order fulfillment.

With warehouses filled with pallets, cases and pieces, filling orders can often be "the most labor– intensive and costly activity for almost every warehouse, where the cost of order picking is estimated to be as much as 55% of the total warehouse operating expense."[1]

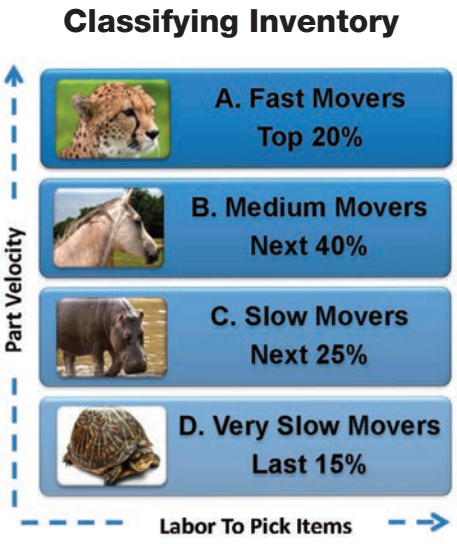
That's because travel time—the time it takes a picker to walk from the point where they receive a pick order to the stored SKU, select the required items, and transport them to the point of shipping—can account for 57% plus[2] of a order picker's direct labor activities. By implementing automation, the 57% of the time for traveling and walking to locate a pick can translate into a 76% of the time actually picking (value added).

There are six basic steps to help warehouse and distribution center managers establish the foundation of an optimized order picking and fulfillment system. The six steps include:

1. Classifying inventory
2. Matching inventory to storage technology
3. Automating to reduce cost
4. Slotting inventory to optimize performance
5. Mapping processes and workflow to maximize throughput and reduce labor
6. Integrating business systems to maximize visibility

Step One: Classifing Inventory |

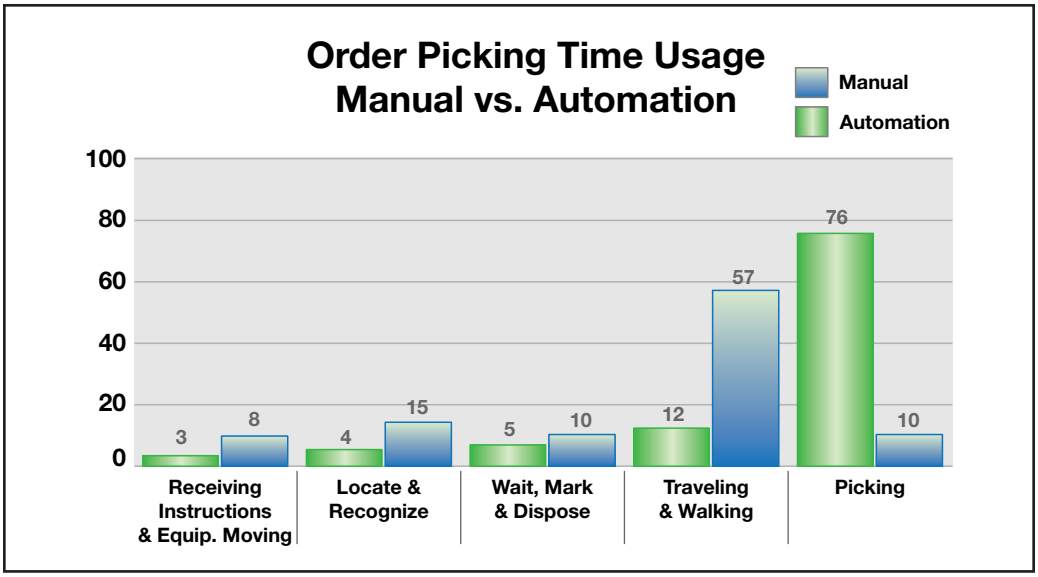
Exactly how a facility's inventory should be categorized depends on many factors, including the types of products and picking sizes common to that business. At the highest level, classify inventory based on picking size (by pallet, case or piece) and by frequency of picking/velocity of movement (fast, medium, slow or very slow).



During the classification process, certain shared attributes will appear. For example, when comparing pick velocity, group fast, medium, slow and very slow movers together. By cross referencing the time associated with picking each of these parts against their order frequency, a cost to pick graph can be created.

Not all "fast movers" are equal. It is critical to note, that every industry, market and organization can classify their picking data from slow to fast... BUT one person's fast can be another person's slow. Comparing the characteristics of a slow mover for spare parts (many parts gather dust) to slow movers in grocery (they turn in days) can throw a wrinkle in analyzing your needs. It is often a good idea to get an integrator's or consultant's opinion to for clarification.

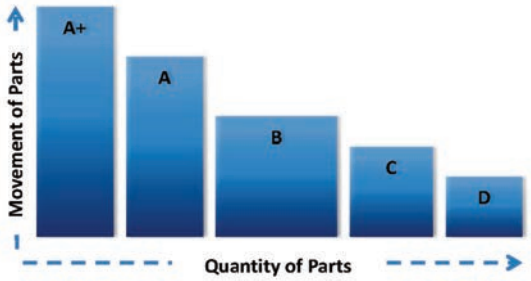
The most dramatic improvements in order fulfillment optimization will come from applying solutions to entire



1 Martin Murray, "Order Picking in the Warehouse," About.com Logistics and Supply Chain Guide, accessed October 28, 2012, http://logistics.about.com/od/operationalsupplychain/a/order_pick.htm.
2 Lee Rector, "Warehouse Slotting," Toolbox.com SCM Blogs, accessed October 28, 2012, http://it.toolbox.com/blogs/warehouse planning/warehouse slotting 6655.
3 Kalid Azad, "Understanding the Pareto Principle (the 80/20 Rule)," accessed October 28, 2012, http://betterexplained.com/articles/understanding–the–pareto–principle–the–8020–rule.

categories of products, as opposed to improving the movement of just a few SKUs. That's because of the Pareto Principle. Also known as the 80/20 rule, this principle observes that roughly 80 percent of effects come from 20 percent of causes or, otherwise stated, "most things in life (effort, reward, output) are not distributed evenly; some contribute more than others."[3]

For example, 80 percent of a company's sales often come from 20 percent of their customers, or 80 percent of a warehouse's picks frequently come from 20 percent of its inventory (the fast movers).



Most companies focus their picking optimization efforts solely on their fast movers which comprise just 20 percent of their inventory. Bear in mind, however, that tremendous gains in efficiency, throughput and cost savings remain to be exploited in medium and slow movers, which likely represents 50% or more of a facility's floor space and picking labor demands.

Step 2: Matching Inventory with the Right Technology

After the inventory has been classified, it should now be clear that all SKUs are not created equal. They vary in size, weight, order popularity, and in a host of other ways. The material handling industry as a whole recognizes these differences and supports them with a variety of different equipment and technologies for effective parts storage.

These include:

- **Drawer Systems** – Storage drawers held in cabinets or within shelving systems that are ideal for smaller items.[6]
- **Shelving** – Storage for non-palletized loads made up of upright posts, formed steel sheet panels as horizontal shelves, and end and back braces or sheet steel back and side panels for support.[5]
- **Pallet Rack** – Single or multi-level storage that supports high stacking of single items or palletized loads.[4]
- **Pick Modules** – Gravity-based flow storage of pallets[7] or cartons[8] that use elevated rails and wheels or rollers within a rack-supported structure. Loaded from behind, contents move toward the pick face by the force of gravity for first-in/first-out (FIFO) inventory management.
- **Horizontal Carousels** – Consist of bins mounted on an oval track that rotate horizontally to deliver storage locations to an operator. These automated storage and retrieval systems eliminate unproductive travel and search time by delivering the product to an operator.[9]
- **Vertical Lift Modules (VLMs)** – An enclosed automated storage and retrieval system that consists of two columns of trays with an inserter/extractor in the center. The inserter/extractor automatically locates and retrieves stored trays from both columns and presents them to the operator at a waist-high pick window, eliminating travel and SKU search time.[11]
- **Vertical Carousels** – Comprised of a series of shelves that rotate around a track—similar to a Ferris wheel—these automated storage and retrieval systems deliver stored items safely and quickly to an ergonomically positioned work counter at the operator's command, eliminating walk and item search time.[10]
- **Robotic Carousels ASRS** – Utilizing a combination of horizontal carousels with robotic inserter-extractor system to constantly feed totes, cases and cartons to one or more work stations.
- **Floor Robots** – A group of carts which pick up and deliver sections of shelving to pick stations.
- **Mini-Load ASRS** – A type of automatic storage and retrieval system that handles

TABLE 1: Storage System Comparison Ranked by Their Benefits

Rankings: 5 = Best (least), 4 = Great, 3 = Better, 2 = Good, 1= Fair (most)

Benefits:	Space & Footprint	Throughput	Labor	Accuracy	Inventory Control	Ergonomics	Expandability	ROI Full System
Drawer Systems	3	1	1	2	3	1	5	2
Shelving	1	1	1	2	1	1	5	2
Pallet Rack	2	3	1	3	3	1	5	2
Pick Modules	2	2	2	2	3	2	4	2
Horizontal	4	5	5	5	3	3	4	5
VLM	5	4	4	5	4	5	4	5
Vertical Carousel	5	3	3	4	4	5	3	4
Robotic Carousels	5	5	5	5	5	5	4	5
Floor Robots	1	4	4	4	4	2	5	2
Mini-Load ASRS	4	5	5	5	5	5	4	3
Mid-Load ASRS	4	5	5	5	5	5	4	4
Unit Loads ASRA	4	5	5	5	5	5	4	3
Shuttle Systems	5	5	4	5	5	5	4	3

4 Material Handling Industry, Order Fulfillment Solutions Industry Group, "Pallet Rack," accessed October 28, 2012, http://mhia.org/industrygroups/ofs/solutions_palletRack.aspx.
5 Material Handling Industry, "Glossary>Shelving," accessed October 28, 2012, http://mhia.org/learning/glossary/s#shelving.
6 Material Handling Industry, "Glossary>Drawer Storage," accessed October 28, 2012, http://mhia.org/learning/glossary/d#drawer-storage.
7 Material Handling Industry, Order Fulfillment Solutions Industry Group, "Pallet Flow Rack," accessed October 28, 2012, http://mhia.org/industrygroups/ofs/solutions_palletFlowRack.aspx.
8 Material Handling Industry, Order Fulfillment Solutions Industry Group, "Carton Flow," accessed October 28, 2012, http://mhia.org/industrygroups/ofs/solutions_cartonFlow.aspx.
9 Material Handling Industry, Order Fulfillment Solutions Industry Group, "Horizontal Carousels," accessed October 28, 2012, http://mhia.org/industrygroups/ofs/solutions_horizontal_carousels.aspx.
10 Material Handling Industry, Order Fulfillment Solutions Industry Group, "Vertical Carousels," accessed October 28, 2012, http://mhia.org/industrygroups/ofs/solutions_vertical_carousels.aspx.
11 Material Handling Industry, Order Fulfillment Solutions Industry Group, "Vertical Lift Modules," accessed October 28, 2012, http://mhia.org/industrygroups/ofs/solutions_vertical_lift_modules.aspx.

loads that are typically contained in small containers or totes, with load weights often under 300 lbs.

- **Mid-Load ASRS** – A crane and aisle automatic storage and retrieval system designed to handle loads up to 2,000 lbs. often placed in a pallet or container in a very cost effective manner and with a redundant back up system available.
- **Unit Load ASRS** – A type of automatic storage and retrieval system that handles large loads up to 5,000 lbs. that are often placed on pallets or containers.
- **Shuttle Systems** - Consists of devices (carts/robots) captured within a closed system. The devices can access any tote in the system or stay in dedicated rows depending on the manufacturer. Totes, trays or containers are delivered to the operator for picking.

TABLE 2: Storage Method by Pick Size

Pallet Picking	Slow	Medium	Fast
• Pallet Rack	X	X	
• Pallet Flow Rack	X	X	
• Mid-Load ASRS	X	X	X
• Unit Load ASRS			X
Case Picking			
• Pallet Rack	X		
• Shelving	X		
• Mid-Load ASRS	X		
• Carton Flow Rack			X
• Robotic Horizontal Carousels		X	X
• Mini-Loads			X
Split / Broken Case / Each Picking			
• Shelving	X		
• Drawer Storage	X		
• Floor Robots		X	
• Vertical Carousels		X	
• Horizontal Carousels		X	X
• Robotic Horizontal Carousels		X	X
• Pick Module			X
• Mini-Loads			X
• Shuttle Units			X

Each type of storage methodology offers different benefits, including the amount of space/footprint it requires, how easily it can be expanded, and the levels of throughput, productivity, accuracy, inventory control, operator ergonomics and the Return on Investment for the entire "system." Initial acquisition cost is where most organizations begin and end their material handling equipment review. This logic is faulty as you may wind up with the least effective system. By looking at the ROI on the system, we can correctly factor in true cost of ownership.

By correlating the specific benefits of each type of storage available with the inventory classified in Step 1, it should be relatively easy to determine which types of methods are most appropriate to meet the picking needs of each category. Using pick velocity (fast, medium, slow and very slow) again as an example, the ideal storage method for each type of pick size (pallet, case or piece) typically breaks down as follows:

Step 3: Automating to Reduce Cost |

Automated storage and retrieval technologies can support further optimization of order fulfillment as a "next–step" component of slotting. As mentioned in Step 1 above, most companies focus the majority of their attention and equipment investments on handling their fast movers. But that leaves 80 percent of their remaining inventory including medium and slow movers un-optimized, and a prime area for additional labor, time and cost savings.

Automation offers the following benefits:

- **Reducing Labor** – Boosts picking rates by as much as 600 percent while reducing labor costs
- **Space Savings** – Saves between 30 to 85 percent of floor space by utilizing the vertical cube of a facility
- **Increasing Throughput** – Speeds order turnover and lengthen cut–off time
- **Better Accuracy** – Utilization of supporting technologies, such as pick–to–light systems, reduces errors with up to 99.9%+ picking accuracy
- **Enhancing Inventory Control** – Improves the quality of information about current inventory status, as well as locations
- **Improving Ergonomics** – Significantly reduces bending and reaching by presenting items to the operator at the correct ergonomic work height, called the "Golden Zone" (waist–high to eliminate bending down to retrieve an item stored low, or stretching up to grab an item stored high).

Step 4: Slotting Inventory |

The slotting process determines the most appropriate place to store each SKU in a warehouse, and further within a storage technology, to meet a variety of goals, typically seeking to achieve maximum efficiency and storage capacity. Common goals can include:

- Improving Space Utilization
- Minimizing Handling of Parts
- Increasing Productivity
- Balancing Workflow
- Improving Inventory & Accuracy
- Enhancing Worker Ergonomics
- Eliminating Travel Time to Product
- Reducing Search Time

Slotting, however, is widely recognized as a "thankless job."[12] That's because slotting requires inventory data, at least a full year's worth, including any seasonality and projected inventory growth. For companies with a warehouse management system (WMS), slotting software or functionality is often included or can be added–on as an additional module. For companies without a WMS, a standalone slotting software application can be purchased, or, in certain cases, a spreadsheet program like Excel maybe all that's needed. Alternatively, a third party consultant can be

12 Bob Trebilcock, "Should you reslot your warehouse?" Modern Materials Handling, May 11, 2011, accessed October 28, 2012, http://www.mmh.com/article/resolve_to_reslot_your_warehouse. 13 Ibid. 14 Dave Piasecki, "Order Picking: Methods and Equipment for Piece Pick, Case Pick, and Pallet Pick Operations," accessed October 29, 2012, http://www.inventoryops.com/order_picking.htm.

engaged to perform the data analysis and make slotting recommendations.[13]

Collected inventory data should encompass:

- SKU Picking Methodology
- Number Of Pallets, Cartons and Broken Case Eaches of Each SKU
- SKU Hits (The Number of Times A Product Is Picked)
- SKU Numbers and Descriptions
- Pick Quantities (Number of SKUs Picked Per Order)
- SKUs That Are Frequently Picked Together
- SKU Sizes and Weights
- Total SKU Quantity, Reorder Point and Reorder Quantity

Armed with inventory data that was previously classified by velocity, it's time to create a slotting plan. First, slot each SKU in the proper equipment (outlined in Step 2) based on pick velocity. This means fast and medium movers should be located in the most accessible areas, while slow and very slow movers should be stored in areas that are less accessible, or farther away.

Then, determine where within each storage equipment or technology each SKU should be placed. Certain constraints may factor into the slotting plan. This is where the information about SKU size and weight particularly comes into play, for example, if the product's dimensions or volume make it impossible to store it in the ideal equipment. Also consider how the product is accessed by hand, ladder, fork truck or order picker, for example) and whether there are opportunities to group SKUs that are commonly picked together in close physical proximity, known as kitting.

For medium movers, a general rule of thumb is to maintain a 20 day supply. Less than a 20 day supply requires excessive time for replenishment. More than a 20 day indicates the space could be better utilized for other SKUs.

Step 5: Mapping Processes and Workflow to Maximize Throughput and Reduce Labor

Now that inventory has been slotted, it's important to look for potential alternative

picking methodologies for further enhancing order fulfillment workflow. These could include:

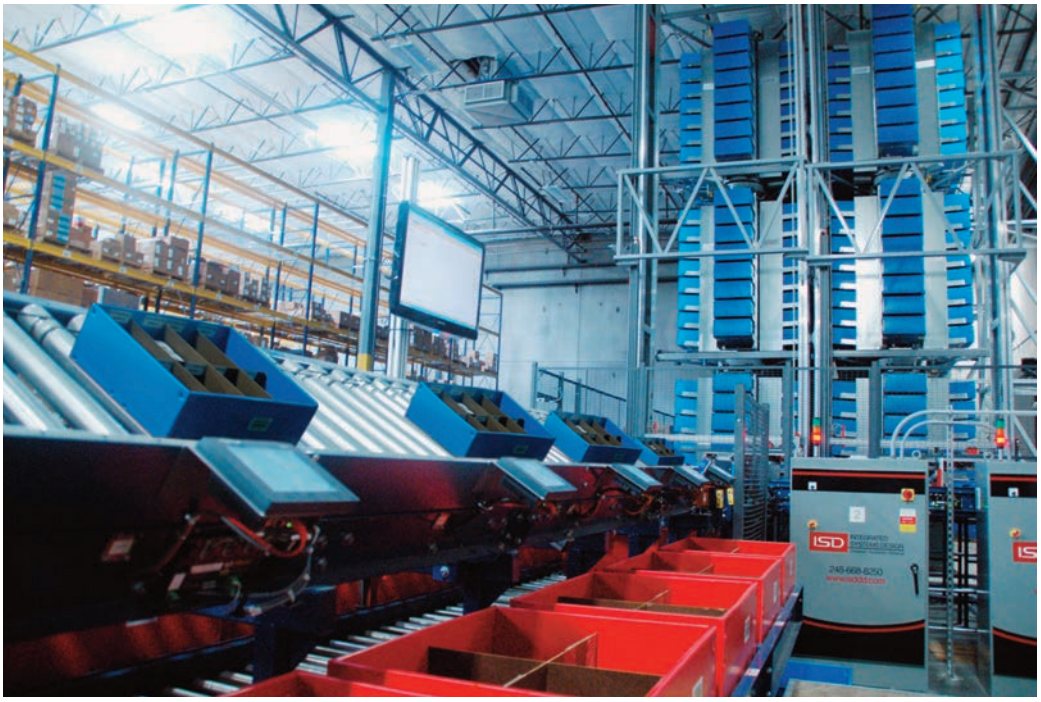
- **Batch Picking** – Grouping multiple orders into small batches, typically including 4 to 12 orders. Order pickers pick all orders in the batch at the same time, working from a consolidated pick list. "Batch picking systems may use extensive logic programmed to optimize orders with the same items. In operations with low picks per order, batch picking can greatly reduce travel time by allowing the picker to make additional picks while in the same area."[14]
- **Zone Picking or Pick and Pass** – Start by breaking up the picking area into individual sections, or zones. Order pickers are assigned to a unique zone and only pick items located in that area. Orders move from one zone to another, which is why this method is also known as "pick and pass." This approach "is most effective in large operations with high total numbers of SKUs, high total numbers of orders, and low to moderate picks per order. Separate zones also provide for specialization of picking techniques such as having automated material handling systems in one zone and manual handling in the next."[15]
- **Wave Picking or Parallel Picking** – All zones are picked simultaneously and the items from each zone are later matched, or con-solidated, to make complete orders. Large operations with a high total number of SKUs and moderate to high picks per order may benefit from wave picking. Wave picking may be used to isolate orders by specific carriers, routes, or zones.

Slotting can also be used to eliminate bottlenecks in work zones and throughout a facility. Although it might appear on paper to be a good idea to consolidate all of the fast movers in a single aisle in one pick zone, in practice it might produce time–wasting congestion. Instead, it might be wiser to spread the fast movers throughout the facility, not only for improved throughput but also to maximize usage of low activity areas, or "dead zones."

Step 6: Integrating Business Systems to Maximize Visibility

To the extent possible, integrate any business systems

15 Ibid.
17 Bob Trebilcock, "Should you reslot your warehouse?" Modern Materials Handling, May 11, 2011, accessed October 28, 2012, http://www.mmh.com/article/resolve_to_reslot_your_warehouse.



already in place such as enterprise resource planning (ERP), warehouse management systems (WMS), warehouse control systems (WCS) and workforce performance management (WPM) or labor management systems (LMS) with the slotting software to better streamline picking processes and inventory manage-ment. This can result in extended order cut–off times and increase visibility to key business partners, including suppliers and shippers.

Additionally, integrating these systems yields tremendous time savings in managing the inventory data so necessary to optimizing order fulfillment (as outlined above in Step 4). By ensuring that these software systems are inter–connected for ongoing communication, repetitive and potentially error prone data entry can be avoided, while enabling broader inventory visibility. Integrated business systems aggregate information to create a single report with the click of a mouse, avoiding manual retrieval and assembly of pertinent datasets.

Finally, this integration will enable the software to facilitate routine re-slotting as needed to accommodate changes in inven-tory, special promotions or seasonal peaks. Regardless of how often a facility re-slots, slotting software is often integrated with a warehouse management system and a labor management system to get the most out of the tool. The labor management system can calculate the cost of the labor associated with the slotting plan based on the labor standards used for that facility. That process provides for an accurate cost/benefit analysis before deciding whether the gains from re-slotting are worth the effort.

If a warehouse accepts the slotting plan, the warehouse management system executes the plan by interweaving the re-slotting tasks with other putaway, picking and replenish-ment tasks that have to be performed during a shift.[17]

By implementing automated storage and retrieval systems such as horizontal carousels, vertical carousels and VLMs to handle fast, medium and slow movers as part of an overall order fulfillment optimization process, a warehouse or distribution center can achieve tremendous gains in throughput while simultaneously reducing costs associated with processing customer orders.

About ISD |

Integrated Systems Design is a leading manufacturer and systems consultant, designer and integrator for warehouse, manufacturing, distribution, wholesale, institutions and retail organizations in North America. ISD systems are renowned for their tremendous value, reliability and ease of maintenance. Systems are designed using technologies from the leading material handling manufacturers of the world.

Solutions designed by ISD focus on providing space savings, increased productivity, reduced labor, higher accuracy and system flexibility to change as activities change in the future. Utilizing proven technology and off the shelf components helps provide cost effective solutions requiring minimum maintenance and yielding fast Return on Investments (ROI).

ISD expertise ranges from handling and picking pieces (eaches), cases, pallets, build lines, and special or custom handling solutions. Products and services include: automatic storage and retrieval (ASRS), conveyor, robotics, batch stations, automatic inserters and printers, pick to light, A-frames, horizontal and vertical carousels, vertical lift modules (VLMs), controls, software (including inventory management, WCS, WMS, MES and ERP), applica-tion and facility consulting and design, AutoCAD, system simulation, moves, installation and service.