



Digital Distribution Point of View

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We at Ascension Logistics have found too many Customer Goods companies engaged in Omni-Channel business have incorrectly addressed digital order distribution. Many CG companies either outsource their digital distribution orders to 3PL companies or they segregate inventory into a separate processing area from their wholesale business in the same distribution center. In either case, there is a great deal lost: expensive third-party labor, dual inventory draining company's working capital and potential delays in meeting the customer order.

As more retailers and marketplaces continue to push the distribution of product down to the Consumer Goods companies, Digital Distribution can fit and work in CG's current wholesale distribution centers. The next five sections explain the important aspects to consider when transforming your wholesale DC into one that handles both wholesale and digital distribution in a highly efficient and effective manner.

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Section 1 – Correct Picking Processes

As consumer product companies go digital with orders coming from a growing list of omni-channel sources, order profiles are evolving rapidly. Oftentimes these profiles are reduced to just a few items per order. To meet these changing demands, Digital Distribution centers are reviewing their picking methodologies to improve efficiency and to quickly get orders on their way to the customer.

There exists many order picking processes can be deployed in a digital distribution environment, and they can be divided into four major picking categories: discrete order, cluster, zone and batch picking. Choosing the correct picking strategy for your Digital Distribution center depends on a variety of factors, including order sizes, warehouse sizes and business needs. By taking into consideration the advantages, disadvantages and best practices for each option, your organization can ensure its picking system meets the demands of your digital order profiles.

Discrete Order Picking

In a normal distribution center, discrete order picking is the most commonly used picking process. This type of picking is used for one order at a time, with the picker walking the entire picking area for each order. Discrete order picking has the advantage of being simple to learn as well as accurate even without using a warehouse management software (WMS) system. For wholesale companies receiving large-cube orders, this process is highly effective, but, is very inefficient for small cube items because each order requires an employee to make a trip through the entire forward pick area and return to home-base after each order is picked.

Discrete order picking should be considered for Digital Distribution only when processing items with large cubic dimensions, when your operation does not have a WMS system and accuracy is a critical business requirement. If your digital distribution center is receiving many small orders or is simply too large for this one-at-a-time picking method, an evolution to a more flexible picking process may be your best option.

Cluster Picking

The next step up in efficiency is cluster picking. In cluster picking, multiple orders are picked during a single pass through the forward pick area; the items are picked and then placed by order into containers. The picker will take multiple orders through a single pass of the warehouse, thus multiplying efficiency by minimizing trips through the picking area.

Cluster picking can be achieved more effectively by using a WMS system. The WMS directs pickers through the pick area displaying what to pick and which container to place the item into



for the corresponding order. This can also happen in a paper-based warehouse when pick-lists are pre-printed and then manually sorted for like items in the pick area. Paper-based cluster picking is less accurate as pickers may pick or place the wrong item into an order as then try to manage many pick-lists, often a post pick quality control check is used to ensure accuracy – costing efficiency as another process is engaged.

Cluster picking is most appropriate for Digital Distribution when handling orders with small cubic dimensions or when your distribution center/pick area is small enough for a picker to efficiently walk through. To maximize order fulfillment productivity, a FastFetch system is used that can direct the picking and putting of many orders at one time in an efficient path.

Zone Picking

To minimize walking the whole pick area, zone picking is used when the entire pick area can be broken up into smaller efficient picking zone. Cluster picking is still used with zone picking to maintain the efficiency of picking multiple orders. When orders can be picked into shippable containers, zone picking has the double advantage of reducing the walking while shipping the container as soon as picking is complete. Zone picking typically requires a complex zone routing conveyor system controlled through a WMS system.

Zone picking should be considered for Digital Distribution when picking items with a variety of sizes, shapes, and storage climate requires the distribution center to be broken into walkable pick zones, and when an appropriate conveyor and WMS/WCS are in place.

Batch Picking

The next step in improving efficiency is when a small number of items are required on many orders through a batch picking process. Batch picking is used when the entire quantity of an item is picked per wave (or batch) and then consolidated with the rest of items for the order. Batch picking is usually used with other forms of picking (Cluster and Zone) for the slower moving items of the order. Consolidation can happen using an off-line Put-Wall process or a complex sortation system.

Batch picking is the best option for Digital Distribution when a small number of items (web-promotional items) are common across a large number of orders. It is also best used when automation can be justified by the reduction of employees to process orders in the distribution center.

Section 2 – Correct Picking Technologies

In the last section, I brought up the fact that in the new digital age, Distribution Centers are going to have to deal with a more diverse order profile: wholesale orders are changing from Pallet size orders to case size orders; digital orders from the web will be more frequent with smaller number of items, because the customer is only ordering what they need. I brought up the need to change picking processes. In this section, I am highlighting the possible picking technologies that will enable the new processes.

Picker to Item

Sending the picker to the items in the picking area is a traditional and the most common method of picking. The material storage fixtures in the pick area range from Rack Shelving, Pallet or Case Flow Rack, and Bin Shelving. To utilize the cube of the DC with high ceilings, Pick Modules and mezzanines are being used. To aid in picking the correct item and quantity for the order, technology has replaced the traditional pick list: RF Scanners, Pick-to-Light (FastFetch) and Voice picking are the most popular technology to assist the picker.

Figure 1: FastFetch



The main advantages for sending the picker to the item are when labor and square footage of the DC costs are lower relative to using other technologies. Many pickers can be put into action to improve the through put of the facility.

Item to Picker

More advance technologies are available that bring the item to the picker. These technologies include Carousels, Mini-Loads, Automated Storage & Retrieval and Mobile storage systems.



Carousels are motorized bin shelving on rails that rotates the items stored on the shelving to a picking station. Carousels include both horizontal and vertical direction and are sequenced to coordinate multiple carousels to improve picking through put. Automatic Storage and Retrieval Systems (ASRS) are an integrated set of lifts that transverse through storage rack picking up containers and bringing them down to picking stations. The classic ASRS is for pallet storage and retrieval. When referring to case sizes or less than cases, Mini Loads are the technology used. Another type of 'Item to Picker' technology are Mobile storage units, like automated guided vehicles they roll the storage device to a picking station highlighting the position on the shelf to pick the product from.

In most cases, these 'item to picker' technologies are coordinated in such a way to keep items in front of the pickers to minimize picker wait time and to maximize their productivity. To achieve this, multiple sequenced pieces of technology are used, sometimes making the cost of the technology prohibitive for the productivity gains.

The main advantage for this type of technology to be deployed in DC's is in areas where labor rates are higher and/or floor space is expensive to the point of justify the technology. The through put restrictions of the technology typically means that these 'item to picker' technology will not work for higher volume items. Thus, the technology must be reviewed with the order profile to cost and through put justify the technology. For example, many smaller lower volume items can increase their storage density in a pick area when using an 'item to picker' technology, i.e. Amazon bought Kiva Systems' mobile storage units to own the technology for their smaller lower volume items like books, now known as Amazon Robotics.

Put to Order Technology

As discussed in the previous article, Batch Pick Technologies have a solid foundation in Digital Distribution centers where Web Promotional items generate a spike of demand for a few items. These few items are waved together to generate a large quantity to be picked in bulk and sent to the 'Put to Order' technology to be divided up by order and combined with the other items of that order.

'Put to Order' technologies range from highly mechanized unit sorters to simple pallet/bin shelving (Put-Walls) to collect the multiple items being picked for an order. Many times, the technology will use a light system that directs the associate to the order location to put a specific number of items in the outbound shipper. For high volume facilities, a unit sorter which is typically a tilt-tray, Bombay or cross-belt type is used to marry up items from different pick zones across the facility. Medium volume facilities with many SKU's which still have multiple pick zones, may use Put-Walls to combine the items from the multiple pick zones. Lower volume facilities may combine 'Item to Picker' technologies with put to light to capture all the items multiple orders on a cart (FastFetch) while only passing the pick face once.

Figure 2: Unit Sorter:



Storage Technology to Compliment Picking

Digital Distribution centers are laid out in a multitude of ways to aid the technology being used for picking. For ‘Picker to Item’ technologies, pick modules were mentioned as forward picking storage means to utilize the cube of the facility. Other type modules may be used, for high volume items Very Narrow Aisle (VNA) storage should be used in conjunction with throw lines to peel off cases and send them to ‘Put to Order’ technologies. For higher to middle volume items, a Pick Module know as a Shave Tower can be used to move pallets of product to the tower so they can be picked to a conveyor line.

To utilize the cube of the facility when ‘Put to Order’ technology is being used, mezzanines are used so both the upper and lower levels are being productive. Value added services and packing stations maybe positioned on one level while the ‘Put to Order’ technology is being used on the other level.

Section 3 – Correct Waving Strategies

In the past Sections, I brought up the need to review picking processes and picking technologies. In this section, I am highlighting the possible waving strategies that will enable the new digital order processes. Waving allows the distribution center management to use order characteristics that can help plan out labor, expected productivity goals, and workload across equipment. Digital orders are often time sensitive making wave planning an important role to managing the order and work flow of the facility for getting orders shipped on-time.

Waving Planning

Wave planning is a term for the process used in a warehouse management system (WMS) to support organizing the daily work flow based on order characteristics, labor and equipment

constraints. Wave planning is applying short-interval-schedules (waves) that balances order characteristics and constraints to ensure orders and work to flow effectively through the distribution center. An important factor in wave planning is to enable order departure plans with the available labor. When the plan is satisfactory, it is accepted. Then the wave planners releases the waves to the warehouse sequentially throughout the day, to allow managers to coordinate the several parallel and sequential activities required to complete the daily work.

The main goal of wave planning digital orders is to ensure the orders are processed efficiently while they meet their departure plans and ship to the customer on-time. Cut-off times are used in coordination with digital orders departure plans to ensure the wave of digital orders can be picked, packed and shipped on-time.

Digital vs. Wholesale Waves

In a distribution center where both wholesale orders are being processed with digital orders, wave planning can be the distinguishing factor. Web promotions may spike demand for a few items, these items can be batched in a wave to ensure picking efficiency. Because labor and equipment constraint can seriously affect the processing times of waves, the design of the facility should be such that flexibility of these constraints can be managed by wave planning. For example, where sortation equipment is being used to match batch picking with the outbound containers of an order, the sortation equipment may have to be design in such a way that a given number of shuts are assigned to digital orders and can be partitioned so two waves can be processed at the same time over the whole sorter. If this partitioning cannot happen, it might be better to send the digital orders to a put wall, so the digital orders are not waiting on the sorter.

Releasing Waves

Previously we have touched the concept of releasing waves, but because of its importance in managing digital orders we will approach the topic in more detail. The balancing act of managing wholesale and digital orders in the same facility comes down to how work is released to the floor. Wholesale waves can be large and demand a great deal of resources and suck the facility resources in such a way that digital waves may be shut down waiting for the wholesale wave to complete. But if the facility is designed with some flexibility and extra capacity then resources can be assigned to just completing digital orders, digital waves can be completed in parallel along with larger wholesale waves. For example, digital waves can be picked using discrete order or cluster picking concurrently as the wholesale waves are being picked. As pointed out above, batch picking can happen in parallel waves as long as the equipment can be partitioned, or another order consolidation technique can be used.



Closing Waves

The end of the wave planning process is to know when to properly close the released waves. Waves can be delayed in being properly fulfilled; replenishments lingering, consolidation of orders being held up or equipment failure has stalled the wave. Closing the wave allows other waves to progress to use constrained resources. These resources, aka equipment must be cleared out of the old wave, so the new wave can properly use that equipment.

For digital orders, using continuous waving or waveless execution systems, FastFetch pick and put systems that prioritizes digital orders or partitioning shared equipment with wholesale waves can keep digital orders flowing through the facility to shipping.

Waves vs. Lean Time Order Release

Lean manufacturing has taught us principals like a 'lot size of one' and 'excess capacity' are preferred. These principals were examined closely by the manufacturing financial community and they were proven to be more important to meeting the customer needs versus some sub-optimal financial goals. The same is true for time sensitive orders in the distribution center, provide extra capacity so the customer delivery dates will be met. Thus, large waves may work for wholesale orders and even two or three-day lead time digital orders but time sensitive digital orders where the customer is willing to pay for premium expedited freight, the orders need to be processed with some urgency.

Such urgency may require digital orders be released as they are received, especially when the order is received with-in a certain time window close to the carrier pick-up time. The emerging execution technology calls this 'continuous waving' or 'waveless'. The warehouse execution system (control system) are handling the release of work to the distribution center to flatten the peaks and valleys of work produced by the classic WMS waving.

Section 4 – Correct choice of Warehouse Management and Control Systems

In my last few articles I brought up the fact that in the new digital age, Distribution Centers are going to have to deal with a more diverse order profile. I brought up the need to change picking processes, technologies and the way waves are built and released to the picking floor. In this article, Warehouse Management Systems (WMS) features will be explored so that the correct WMS will be chosen to fit the new Digital Order Profile.

WMS Provider Functionality

There are a wide variety of WMS vendors and functionality they provide in their software. Many articles have been written that break down the providers into Categories. Software reviews from companies like Forrester or Gartner have their ways of categorizing these providers. This article will categorize based on the important functionalities for processing digital orders and relative cost for this functionality – Experts in Picking, Waving and Interfacing with Warehouse Control Systems (WCS) and other peripherals required for digital order processing.

The first group of WMS software vendors provide full functionality at a relatively higher price because of those features and functions can be configured in the software. On-Premise best-of-breed (BoB) leaders are in this grouping, depending on requirements these companies have a prominent place in providing for a full digital distribution center.

The second group of vendors provide a good amount of functionality at a moderate price level. Leading this group maybe the warehouse module of the company's ERP system. Also, moderately priced BoB companies following the leaders can provide significant value for the features they offer. However, the digital order profile functionality may not be configurable in these WMS and modifications or enhancements may be needed to make the software work correctly to meet your digital order profile.

The third group of vendors are led by WMS 'software as a service' (SAAS) or cloud-based providers. For smaller operations, these subscription-based services can provide significant value for the requirements they fulfill. However, the digital order profile features will need to be coded into the way the software functions.

Digital Features of a WMS

To enable the picking process and to ensure digital orders get shipped on time, certain waving methodologies are going to be required. Whether it is wholesale or digital orders, picking items from the same inventory using the same staff across the same equipment means a better utilized and efficient operation. WMS waving is the key to achieve this productivity. The WMS will have to interface with picking peripherals and WCS in order to work effectively. The leading BoB providers offer these as configurable features. The ERP warehouse modules and follower BoB, as well as, SaaS/Cloud providers may need to have these features coded into their WMS.

Picking Features - Some WMS provide better picking functionality than others. Almost all WMS provide multiple ways to discrete order pick, using different technologies to facility most accurate and effective ways to pick orders. But only a few WMS properly provide all advance picking methods – Cluster, Zone and Batch picking. All picking methods to make your digital distribution center be more productive.

Pick Location Features - Also required from a WMS is the ability to have the pick area divided up by zones. The same item will need to be slotted into multiple zones to allow for multiple picking methods to work effectively. Late in the shipping day, batch picking may not be time effective and orders may have to be picked from a discrete location to get the orders shipped on-time.

Order Waving Features - Another important feature is the ability to wave orders properly to take full advantage of the picking methods and technologies. At a certain cut-off point, lean picking of a digital order maybe required to get that order shipped on-time. The WMS/WCS will also need to allow orders to be released order by order to the picking areas as they come in to get them shipped on-time (Waveless).

Interface to Peripherals – Picking technologies and WCS require the WMS to have application programming interfaces (API) set-up to automatically communicate with the peripherals. Having the API's pre-programmed and part of the WMS will ensure improved speed of implementation and better quality and reliability of the interface. Only the leading BoB's will have the wide variety of API's required.

Warehouse Control Systems

The WMS will need to be able to interface with warehouse control (execution) systems (WCS) that can properly route picked product to correct places for order consolidation, value added services, packing and shipping based on carrier with time-based requirements. The leading BoB WMS' have application program interfaces (API's) already designed into the software for proper communications to the WCS. Some follower BoB's must be enhanced or modified to communicate to the WCS. Most SaaS or Cloud-based WMS will have to have these interfaces designed for the specific application and coded.

As referred to in my previous articles, the WCS will need to be able to handle partitioning Put to Order technologies to properly consolidate zone picked and batch picked items. A vital feature to properly handle digital orders is a productive way to get orders ship on-time. An emerging feature of some WCS' are the ability to release work to the distribution center to keep work load, equipment capacities and shipping priorities properly aligned. The terms 'Continuous Waves' or 'Waveless' are becoming used more prevalent in WCS. As this technology/methodology begins to mature, the use of waving in the WMS for work load balancing may become obsolete. Digital orders can continuously drop into WCS as the orders come into the WMS.

Section 5 - Planning in the Digital World

This section addresses the proper inventory planning that is needed to meet the changing digital order demand. Questions like: 'How does a Consumer Products company plan for the changing order profile?', 'What tools are needed to address this type of planning?', and 'Are there techniques that can pull demand through the supply chain, so that less inventory is required because of the large variation in digital demand?', will be addressed in the pursuing section.

Differences of Digital Demand vs. Traditional Demand

Some people believe that demand is demand, that there is no difference between traditional wholesale demand and digital demand. A retailer ordering hundreds/thousands of units each week but wants them dropped shipped to their individual stores is very different from hundreds/thousands of consumers ordering one or two items to be shipped to their home. In the prior, rolling up demand across a retailer or a segment week over week is much easier than trying to determine which consumer is going to place another digital order and when.

So how does a Consumer Products company plan for digital demand? Some try to use traditional planning tools but realize that the planning parameters and order patterns are quite difficult to predict. Others may plan for their traditional wholesale demand and add an extra safety stock

factor for digital demand. What this article will address is a third method of planning for digital demand, a Lean practice called Demand-Pull. Before we dive in, let's first look at traditional tools.

Advance Planning System

Every Enterprise Resource Planning system (ERP) has a demand-planning module; some are stronger than others are. For more sophisticated planning, companies add an Advance Planning System (APS) to their business systems. APS tools are very good at creating high-level demand plans; they can properly sort through seasonality and consistent demand and they have the sophistication to bring in promotion and event planning. The basic parameters to properly manage a planning tool are historical demand, forecasted demand (promotions and events), customer service targets, statistical safety stock policies, product shelf life, supply chain capacity and lead times to fulfill orders. Planning should also take into account transportation constraints and inventory holding costs.

For years, planners have used this information to set up statistical safety stock by measuring the volatility in supply, transportation and demand for their wholesale orders. However, accurately capturing digital demand variability is a daunting task. Some try to aggregate digital demand by region and calculate the variability of that aggregated demand. In the following sections, the Lean practice of demand-pull will be explored as a way to properly maintain inventory levels as digital demand is pulling inventory through the supply chain.

Lean Principle – Demand-Pull

Many distribution centers (DC's) use Demand-Pull practices as a replenishment strategy to keep inventory in their pick-able locations: when inventory drops below a minimum level, a replenishment task is generated to fill the location back up to its maximum inventory level. Thus, as digital orders, deplete inventory below their reorder point ($ROP = \text{Average Consumption over Lead-Time} + \text{Safety Stock}$), a purchase order (PO) release is generated to the supply chain to replenish inventories. This is known as Demand-Pull for supply chains, allowing sales to generate demand triggers for inventories that the supply chain then fulfills. Using the planning systems, discussed in the previous section, to properly set-up blanket PO's and ROP (minimums), when demand triggers for a replenishment, a PO release is sent to the supply chain for more inventory. PO release quantity or reorder quantity (ROQ) is a factor of expected demand over lead-time, which could bring in forecasted demand for promotions, events and seasonality or could just be historical demand. ROQ is constantly monitored by the APS to make sure the proper inventory is being planned for.

As demand-pull is used in replenishing inventory for Consumer Products company's digital orders, the supply chain network allows for quick response to PO releases, lowering overall lead-time, variability and thus safety stock levels. A continuing effort to lower lead times and reduce

variability in the supply chain has a positive spiral effect on lowering overall inventory throughout the supply chain. Blanket PO's from the company's planning system and proper monitoring of safety stock, ROP and ROQ levels are required for demand-pull to be successful. Allowing demand to pull inventory through the supply chain has been proven to be more successful in many manufacturing environments versus the old forecast 'demand-push' of inventory through the supply chain. Let's take a look at replenishment in a multi-DC organization by first looking at distributed order management.

Distributed Order Management Systems - Digital Ecosystems

The distributed order management system (DOM) aids in managing and optimizing the flow of each individual order through the digital distribution network by mapping each process. As such, DOM acts as a hub for a complete view of each order lifecycle, providing one common view for:

- The complete order for placement, mode of delivery and returns
- The Procure-to-pay and order-to-cash cycle for an organization
- Transparent and organization-wide inventory visibility and management
- Archived transaction information for analytics and strategic decision making across the business processes

Orienting business processes to a DOM system and configuring it to drive flexible cross-channel fulfillment leads to a fully functional and efficient digital ecosystem while enabling enhanced consumer engagement and experience uniformly across all channels.

Distribution Center Replenishment

Larger Consumer Products companies have multiple DC's in any one country to improve customer service levels. With offshore manufacturing and ocean container shipments, these companies have to find ways to maintain inventory to eliminate stock outs. Some warehousing inventory strategies include a Hub and Spoke network of DC's: holding inventory in country at a hub location that receives demand-pull triggers from other warehouses for timely replenishment of inventory. Another strategy is to have overflow fulfillment of sales orders coming from warehouses that have the inventory. Although this negatively affects service level and may increase transportation costs, it can lower overall inventory holding costs. A third strategy is to have just one distribution center with inventory for a particular SKU and pay the additional shipping costs to get it to the digital consumer.

Having a strong DOM is important to a multiple inventory distribution network. Putting in the right DOM may be costly. Therefore, the cost of a DOM has to be compared to the additional transportation costs of having a single location for each item, a lower overall inventory carrying costs; however, there are opportunity costs associated with customer service levels of servicing out of just one DC. The latter point is often the justification for installing and maintaining distributed order management systems.



Conclusion:

The transformation to a digital company means order profiles will continue to change, lowering the number of lines per order as consumers order only what they need at that point in time. As the number of lines per order changes, so will the requirements for picking those orders. Digital Distribution center layouts are very unique depending on the order profile and the way orders are being waved. A wide variety of technologies are available to be used for the most productive and effect ways to process digital orders.

Digital Distribution relies as much on picking methods, equipment, waving practices and systems to ensure the proper fulfillment of orders. Digital Distribution can coexist with the wholesale business in the same distribution center, so inventory can be properly utilized as well as both labor and equipment. Continuous waving/waveless execution systems will be used more as the digital landscape of fulfilment evolves. Although there are many WMS products to provide good functionality to work in wholesale distribution, there are only a few WMS products that can provide the correct combination of features to fit the new digital order profile while maintaining the wholesale business. Most APS struggle planning for the digital order profile while maintaining the wholesale business. Demand-Pull methodologies will enable the digital distribution center to manage and reduce overall inventories.

As this article shows the many advantages of picking methods, technologies, software management/control solutions and planning methodologies, Digital Distribution professionals will be required to match the order profiles and waving methods with the appropriate layout of the technologies and methods. To properly plan your Digital Distribution environment, a skilled professional is worth their fees multiple times over as they will properly design the Digital Distribution Center, so orders will be properly fulfilled while the efficiency and utilization of the facility are being optimized for both the wholesale and digital businesses.

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