ORDER PICKING SOLUTIONS

UNDERSTANDING YOUR OPTIONS

White paper written by
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INTRODUCTION

A supply chain, serving consumer demand, encompasses everything involved in supplying a product or service to a consumer. This includes production, fulfillment, and delivery. In the past, consumer demand for quality and price had driven the goals associated in this network. Today, increased consumer demand for shorter delivery times [1] on individual consumers' smaller, more frequent orders help drive much of the goals in today's supply chain, and specifically in today's fulfillment centers. These goals include moving product and fulfilling orders quicker to reduce delivery time while maintaining order accuracy. These goals are targeted by improving data accuracy, increasing fulfillment capacity, and maximizing productivity.

These targets are addressed through any number of solutions. Building fulfillment facilities closer to the end consumer, hence localizing the distribution, can help shorten delivery time. Enhancing a fulfillment facility's software can help facilitate workers, better organize, and speed the workload. Introducing automation such as conveyance, shuttle systems, autonomous mobile robots, or robotic picking can help speed product travel and increase order accuracy. And streamlining processes, including choosing an appropriate order picking solution, can help speed order fulfillment while maximizing productivity.

Although choosing an order picking solution is necessary, the benefits and drawbacks of selecting one over another are often overlooked. With order picking accounting, in most cases, for over 50% of the labor in a fulfillment center, choosing an optimal picking solution can help reach goals of increasing order volume, maximizing productivity, reducing labor, improving order accuracy, and ultimately speeding delivery time.

Along with these goals, in choosing a picking solution, we seek solutions that allow for scalability in terms of productivity demands (e.g., peak versus non-peak season or projected annual growth), order types (e.g., e-commerce versus retail fulfillment), ease of implementation, the ability to utilize available space, and solutions that come with a reasonable price tag.

This paper is divided into a couple sections. First to describing various elements of an order picking solution. Second to illustrating how an individual fulfillment center's parameters affect order picking solutions. And lastly, walking through a few examples to help illustrate some available order picking solutions.

UNDERSTANDING THE ELEMENTS OF AN ORDER PICKING SOLUTION

To better understand order picking options, one can dichotomize some of the elements within an order picking approach. For the sake of differentiating elements within an order picking approach, define the order picking solution to be the unique set of options in the order picking approach. Further, define elements involved in an order picking solution as the order release policy, order picking strategy, order picking structure, order picking technique, and order picking method. Several order picking element combinations can be seen in Fig. 1. The following are many of the most popular options within an order picking solution.

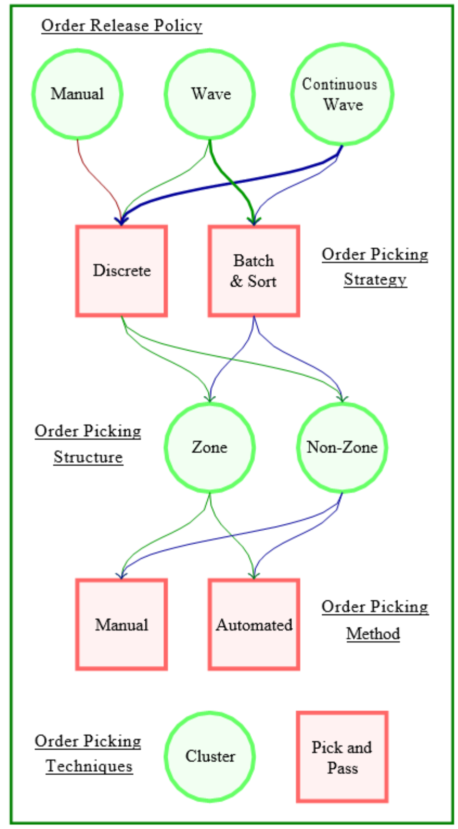
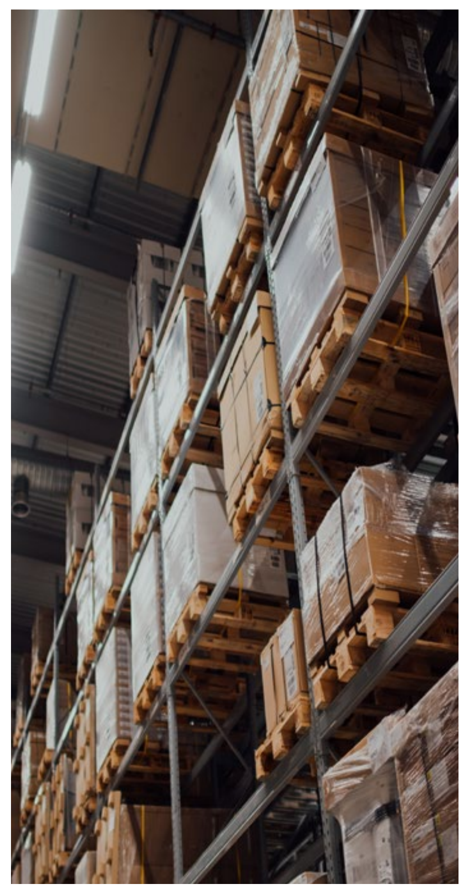


Fig. 1. Illustrating Order Picking Combinations

1. (Discrete/Fixed) Wave Policy – An order release method that uses pre-determined groupings of orders into intervals called "waves". These waves consist of multiple orders on the basis of location, priority, and/or product affinity with the primary goal of reducing order picker[1] trips and maximizing productivity.

Beyond the goal of improving productivity, other benefits to a (discrete) wave policy include; having the ability to organize the planning of orders, improving the ability to forecast labor demand, and providing visibility to staff performance. These benefits are gained by having order knowledge and the ability to schedule known orders.

One criticism of the wave policy is that not all waves disperse work equally, causing some order pickers wasted time waiting for work on the following wave to be released. In order to help alleviate this issue, many wave policies release waves in parallel (i.e., overlapping waves), rather than sequentially.



[1]Throughout this article, "order picker" will refer to a person or individual performing an order picking task. That is, as opposed to the material handling equipment referred to as an order picker.

That is, many wave policies schedule the release of waves in concert of another wave or other waves to help even out the day's workload. This approach is not without effect. In reducing order picker work discrepancy, causing multiple worked waves at a given time, there is potential for downstream effects. Specifically, staging and consolidation areas must be equipped to handle multiple waves of orders. This can be accomplished by restricting wave size to allow various waves being consolidated concurrently or engineering a buffer area, holding picked orders awaiting previous wave completion to be released into consolidation.

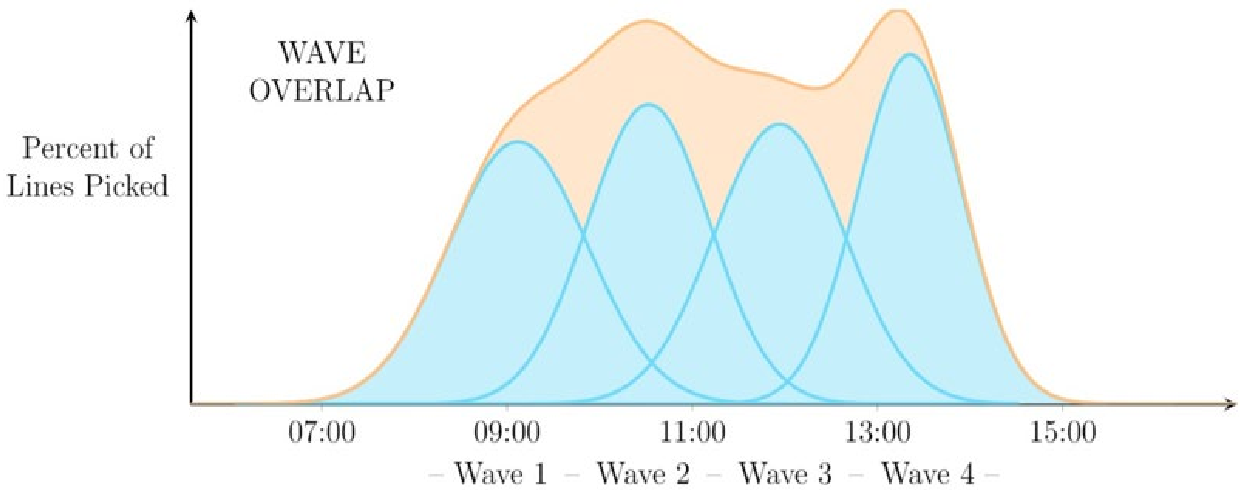


Fig. 2. Overlapping Wave Release Shift Productivity

2. Continuous Wave Policy – An order release method that allows the grouping of currently worked orders to evolve dynamically. That is, at any point in time, a continuous wave policy enables the system to transfer new orders to the current workload (or current wave). The idea is to optimize productivity by understanding each order picker's location and workload, and introducing new orders that help optimize the current path and promote constant productivity.

For both discrete and continuous wave policies, the maximum wave size is often determined through downstream sorting and consolidation processes. There must be enough space to house a consolidation effort that holds orders from the first item in, to the final item out. The difference, in principle, is that continuous wave policies allow for order-by-order replacement. In contrast, discrete wave policies allow for a wave-by-wave replacement (which can be partially offset with overlapping waves). Hence, given that unique orders complete at different rates, a continuous wave policy allows (again, in principle) for a higher volume of orders to be completed in the same amount of time as a discrete wave policy. Of course, there are many factors affecting completion rates and order volumes, and therefore, this difference may be significant or overvalued.

In general, continuous wave policies are well-suited for e-commerce businesses focusing on next day delivery by allowing newly received orders to potentially be worked upon receipt. For this same reasoning, continuous wave order release policies also help with priority orders. However, a drawback of this policy is its dependence on precise order timing and the need for complex, sophisticated software. That is, continuous wave policies require a great deal of orchestration to work properly. For example, a misaligned release, building congestion at the sorter, and preventing orders from completing may lead to gridlock [2] and halt production.

Although there are differences between discrete and continous wave policies, both are more complex and sophisticated than the **Manual Order Release Policy**. In the manual order release policy, which is implemented in many facilities today, orders are fulfilled as needed. There is no systematic queuing; rather, any and all orders currently available to the facility are able to be picked on demand.

3. Discrete Picking Strategy – An order picking strategy in which each order is picked without the need to sort. In other words, once an order is picked complete, it is ready for packing. There are several advantages to using a discrete picking strategy. Two of these advantages include its ease of implementation and visibility to order picker accuracy and performance. As a drawback, discrete order picking often leads to excessive picker travel.

Consider, for example, a facility where each picker is responsible for completing one order at a time. If picker 1 needs two items for the current order (items A and B), then needs only item C for the following order, and item C is located halfway between items A and B, the excess in the distance traveled using the discrete picking strategy is no less than 50% greater than if items A, B, and C were picked simultaneously. Obviously, this is a trivial case, but it offers a glimpse into potential time wasted in order picker travel.

4. Batch and Sort Picking Strategy – An order picking strategy used to reduce picker travel distance by reducing the number of trips to each product location. The tradeoff in reducing order picker travel using the batch and sort strategy is the need for further product sorting and order consolidation between the picking and packing processes. The advantage of this strategy comes strictly from reduced order picker travel. The ability to take a fraction of the trips to each pick location helps maximize order picking productivity.

One type of order that is almost always suggested to be batch picked, given it needs no sorting or consolidating, and takes full advantage of the batch pick, is the single unit (or single line, single unit) order. If these orders make up any substantial portion of a facility's orders, then batch picking is an obvious choice.

Often, deciding between discrete and batch order picking comes down to factors such as order count, SKU count, and SKU affinity. For example, a facility fulfilling 10,000 e-commerce orders a day is likely to batch pick orders. In contrast, a facility fulfilling 10 retail replenishment orders a day is likely to discrete order pick. Likewise, a facility fulfilling a large number of small quantity orders over a vast area housing 300,000 SKUs is likely to batch pick and sort orders.

5. Zone Picking Structure – The division of the active pick area into either static or dynamic pick "zones" is referred to as zone picking. The aim with zone picking is to help reduce order picker travel and congestion. An order picker assigned to a zone is responsible for the picks in that zone[2]. Which, in effect, reduces the area the order picker must travel and allows order pickers their "own" space to work. Like the wave policy, criticism of zoning is the potential difference in workload. Many facilities implement a zone balancing strategy that adjusts zones to even out workload to overcome this drawback.

Although zones are generally created to segment both SKUs and order pickers, they can also be used to segment only order pickers. That is, SKUs could be replicated in each zone, but zones are created to eliminate order picker congestion. This can be useful for a facility housing a small number of high-volume SKUs. This replication can also be used for fast-moving SKUs. That is, having multiple zones house fast-moving SKUs, but only housing slower-moving SKUs in one zone, further balancing order picker workload.

Some zoning principles can be achieved within a non-zoning pick and pass atmosphere through a method called the "Bucket Brigade" [3]. This is achieved when order pickers take responsibility for an order or group of orders from an upstream order picker once their previous order or group of orders has been moved to the next order picker. The need to understand and schedule by relative order picker speed is about the only planning needed, which is a huge benefit along with its ease of implementation. A drawback to this strategy is the potential in wasted search time in finding the upstream order picker to relieve.

[2]It should be noted that zoning product can be accomplished without zoning order pickers.

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6. Cluster Picking Technique – A technique to reduce order picker travel by allowing multiple discrete orders (or multiple batched items) to be picked prior to order picker release. This has a batch-like effect in that an order picker picks items to fulfill multiple orders, hence reducing the visits to each location. In a discrete picking strategy, if numerous orders do not hinder travel productivity (i.e., if one order isn't the maximum towing capacity of an order picker), then cluster picking offers an obvious advantage to time and labor savings.

7. Automated Picking Method – An order picking method that utilizes automation in one or more tasks within the order picking solution. Automation encompasses a wide range of applications. These applications could be as simple as a conveyor line that takes picked orders from an active pick area to pack stations. It could be a goods-to-person system that stores and retrieves product directly to order picker stations. It could be an automated dispenser, like an A-Frame, that dispenses product into cartons. And it could be a person-to-goods system that utilizes the aid of an autonomous mobile robot (AMR) directed to an active pick location to await order picker activity.

There are many different automated order picking solutions available. The main goals in an automated solution are to reduce working capital, increase labor efficiency, decrease labor needs, and more effectively utilize space. Beyond these goals, the level and predictability of productivity in a highly automated facility makes it an attractive solution. That is, the level of productivity in terms of increased throughput with the potential of extending, without cost impact, to a 24/7 operation is an attractive benefit. Further, automation offers a predictable productivity insofar as an automated solution generally has pre-determined speed and capacity. For example, suppose a facility utilizing an Exotec Skypod System (a high-performing automated goods-to-person storage and retrieval order preparation system) can pick, on average, 260 lines (or say 1560 units if averaging 6 units per line) per hour per order picker (defining a line as a unique SKU/Order combination). If we know that a given day's workload requires picking 12,000 lines in an eight-hour shift, we can see that there will be a need for 6 order pickers.

As mentioned, there are many benefits to investing in automation (reducing working capital, increasing labor efficiency, etc.). However, there are drawbacks that should be vetted on any automated solution. These may include limited flexibility in cases of a changing environment, single points of failure potentially halting facility productivity, or a substantial up-front capital investment.

USING FACILITY PARAMETERS TO HELP CHOOSE AN ORDER PICKING SOLUTION

Beyond the goals of increasing productivity, order throughput, and labor efficiency, reducing working capital, and optimizing facility space, facility parameters can have major impact on an order picking solution. These parameters include both numeric operations' metrics, such as, orders per day, lines or units per order, unique SKU quantity, as well as characteristic parameters like service-level agreements (SLAs), product unit of measure (shipped in eaches, cases, or pallets), and product type (e.g., hazmat, fragile, kitting needed, etc.). As we describe these parameters in more detail, keep in mind most operations involve a blend of these parameters.

Examining some of the characteristic parameters in a little more detail, one of the first items to undestand is order fulfillment type. What "type" of order is being fulfilled? A facility fulfilling 15 retail location orders daily is likely to order pick differently than a facility fulfilling 10,000 e-commerce orders daily. Retail, wholesale, and other business-to-business order fulfilling often lends itself to discrete picking, especially when quantities or lines per order are high. E-commerce orders, on the other hand, are usually much smaller in quantity per order, but larger in quantity of orders. Along with order types, order fulfillment unit of measure plays an order picker handling role. A beverage distribution facility may ship items in pallet or half pallet quantities, limiting the amount an order picker can pick at any given time. This may dismiss any type of cluster or batch picking. Along the same lines, product type can play a significant role in the order picking solution. It may be mandatory to separate hazmat products from non-hazmat products, and in effect, creating a zone structure. Similarly, value-added services like kitting or hazmat labeling may hint to specific picking solutions.

" Much like the characteristic order type, an order metric defining number of orders per day plays a role in various aspects of the order picking solution."

Service-Level Agreements (SLAs) often include time limit conditions, restricting a facility's window from order reception to order departure. These conditions can influence the final order picking solution. An e-commerce fulfillment facility with a two-day service level agreement most likely operates differently than a vehicle parts fulfillment facility who might see orders a week in advance.

The order assignment method (the way order pickers receive direction) can have a role in choosing an order picking solution. Order pickers picking in a paper-based system (e.g., picking from a printed invoice and initialing as verification) is very different than picking in a pick-to-light system, where the pick is driven or directed by a series of lights with confirmation controls. Both of these methods operate different than a radio-frequency (RF) handheld based system or a voice-based system.

Much like the characteristic order type, an order metric defining number of orders per day plays a role in various aspects of the order picking solution. Fulfilling an average of 16 orders per day is far different than fulfilling an average of 16,000 daily orders. Moving from orders per day into order profile, lines (or units) per order can affect the way a facility goes about picking orders. A facility where 80% of orders are single-unit orders has little downstream activity to consider within the order pick method. In comparison, a facility fulfilling 3% single unit orders and 95% of orders containing 2-5 SKUs with little SKU affinity (i.e., SKU commonality) may see extreme order picker travel differences using differing order picking methods.

Another metric parameter affecting the order picking solution is the SKU pareto. That is the natural breaks in SKU count with respect to volume. A simple way to find a pareto is to take total movement by SKU for a specific timeframe and order that list in decreasing order by volume. Record the SKU count accounting for each 10% volume increment. You may find the top 10- 15% of SKUs account for 60-70% of the volume. Fig. 3 provides a visual of a SKU pareto. This information can help choose how to zone an active pick area, and appropriate automation needs when considering automated solutions.

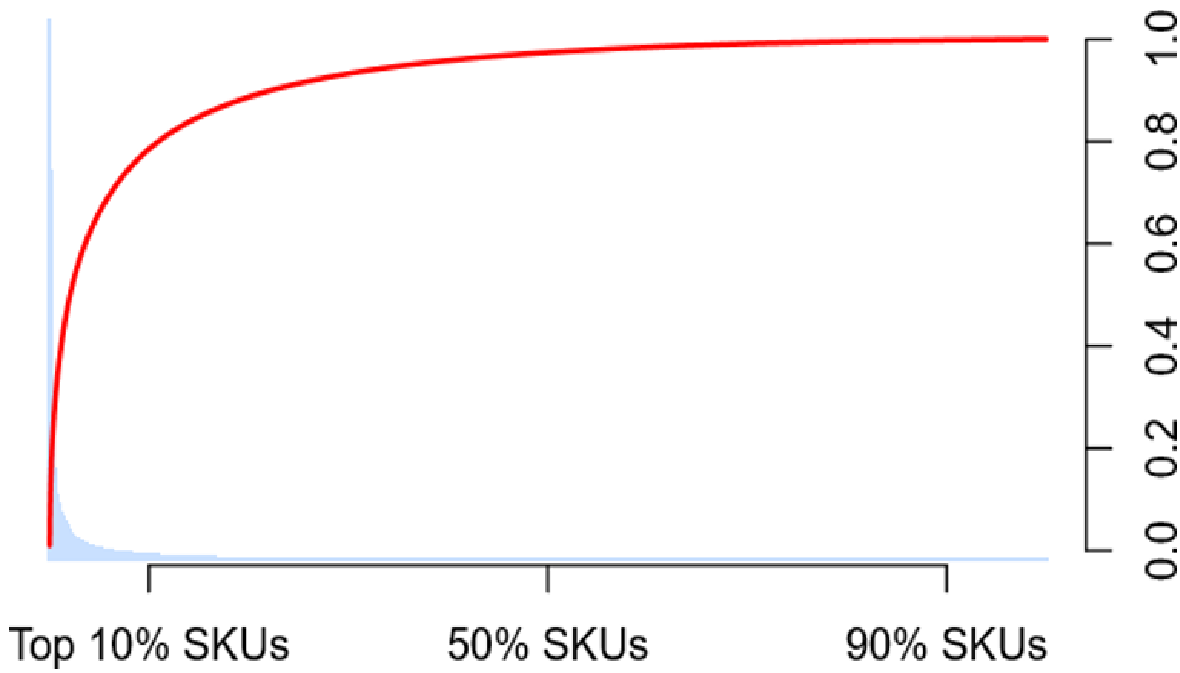


Fig. 3. SKU Pareto – here top 10% of SKUs = 82% of movement

Another metric, often overlooked, is employee turnover (and similarly, available labor market constraints). Full-time employee turnover and seasonal labor changes incur difficulties faced with filling an onslaught of roles. Turnover rates may have an impressionable influence over how complicated an order picking solution should be. Suppose a facility goes from 500 to 1,200 employees during a one-month peak season. In that case, there may be a need for an order picking solution that has the ability to integrate people quickly into the operation, focused on speed and efficiency. For example, voice picking is considered an out-of-the-box, easy to understand order assignment method.

It should also be noted that the choice of a picking solution is not solely driven by parameters of interest mentioned above. To choose an optimal picking solution, one should also be open to what parameters can be changed to optimize a chosen picking solution. For example, a facility's inventory storage strategy can be arranged to help optimize a chosen picking solution's success. Whether that be inventory organized by category or manufacturer, organized by volume (high volume items together and low volume items together), or stored in a, more-or-less, chaotic but flexible manner.

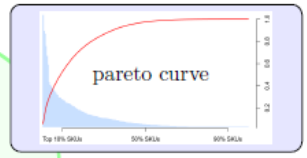
Lastly, below are three examples of different fulfillment operations along with individual metric parameters extending to a potential order picking solution. Often, decision breaks, in evaluating an individual facility, may not be straight forward. This is one of many reasons to seek a professional consulting or integrating team to help navigate these choices.

Example 1:
An e-commerce company in their fourth year of business has seen a dramatic surge in volume of orders over the last 6 months and has been experiencing difficulty fulfilling orders at the rate they've come to expect. As an emerging company, their capital is limited but they have interest in low to mid-budget automation.

Working five days a week, the metrics noted represent generalized one year projections. Also, one of three items considered promotional product, is chosen by the order picker for each order.

Order Profile:
- 6700 daily orders
- 4 lines per order
  - 3 lines per order without Promo Material
- 1 unit per line
- 25% of Order are single unit without Promo Material

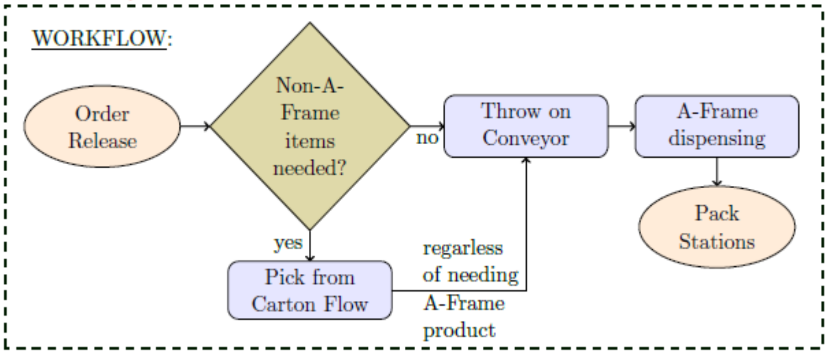
SKU Profile:
- 350 Total SKUs
- 130 SKUs Move Daily



Product is largely small, rectangular, cartonized units.

Key Takeaways:
- Small SKU Count
- Relatively high volume SKUs
- Seeking greater throughput
- Limited Budget

Potential Order Picking Solution:
- Automation in A-Frame (~70% of items fit in an A-Frame, accounting for 92% of the volume)
- Automation in Conveyor between pick area and pack stations (needed for A-Frame and hence extended throughout)
- Discrete pick-to-tote (A-Frame automation enhanced dispensing into uniform containers and discrete picking allows no further sort between pick and pack)
- Wave Order Release (based on current management system with limited enhancement)
- Promotional Material placed at pack stations
- Non-A-Frame items picked from carton flow



Example 2:
A long-time retailer with 100 brick and mortar locations and one distribution center has had several years of steady e-commerce and retail growth. Projected to outgrow their current DC within the next two years, they are looking to build a new DC with low to medium automation, operating seven days a week.

Product range in terms of size, security, mobility, and control creates a complex product mix demanding different storage mediums and different control parameters. Also note, orders bound for retail are either large enough to be placed directly on a pallet or must be combined with other items in a tote that is then placed on a pallet.

Order Profile:

Retail:
- 12 daily orders
- 2400 lines per order
- 3.5 units per line
- 70% of Lines are placed in totes accounting for ~25% of outbound load

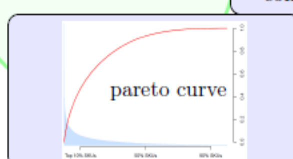
E-comm:
- 1700 daily orders
- 1.5 lines per order
- 1.5 units per line
- 75% single unit

In general, size range is as large as a refrigerator to as small as a penny.

SKU Profile:
- 100,500 Total SKUs
- 12,500 SKUs Move Daily

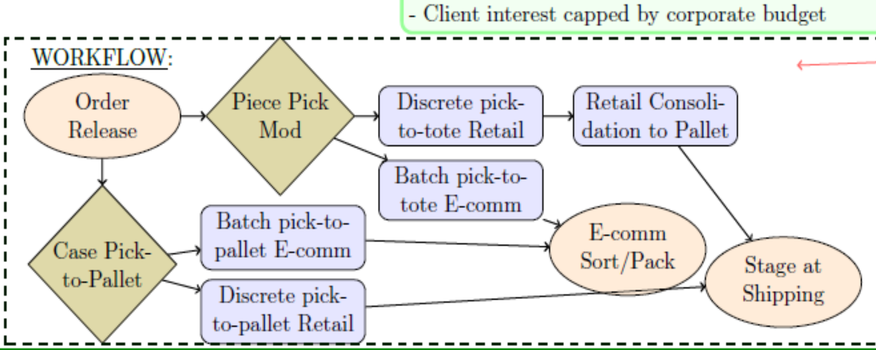
4% of items are haz-mat (9% of lines)

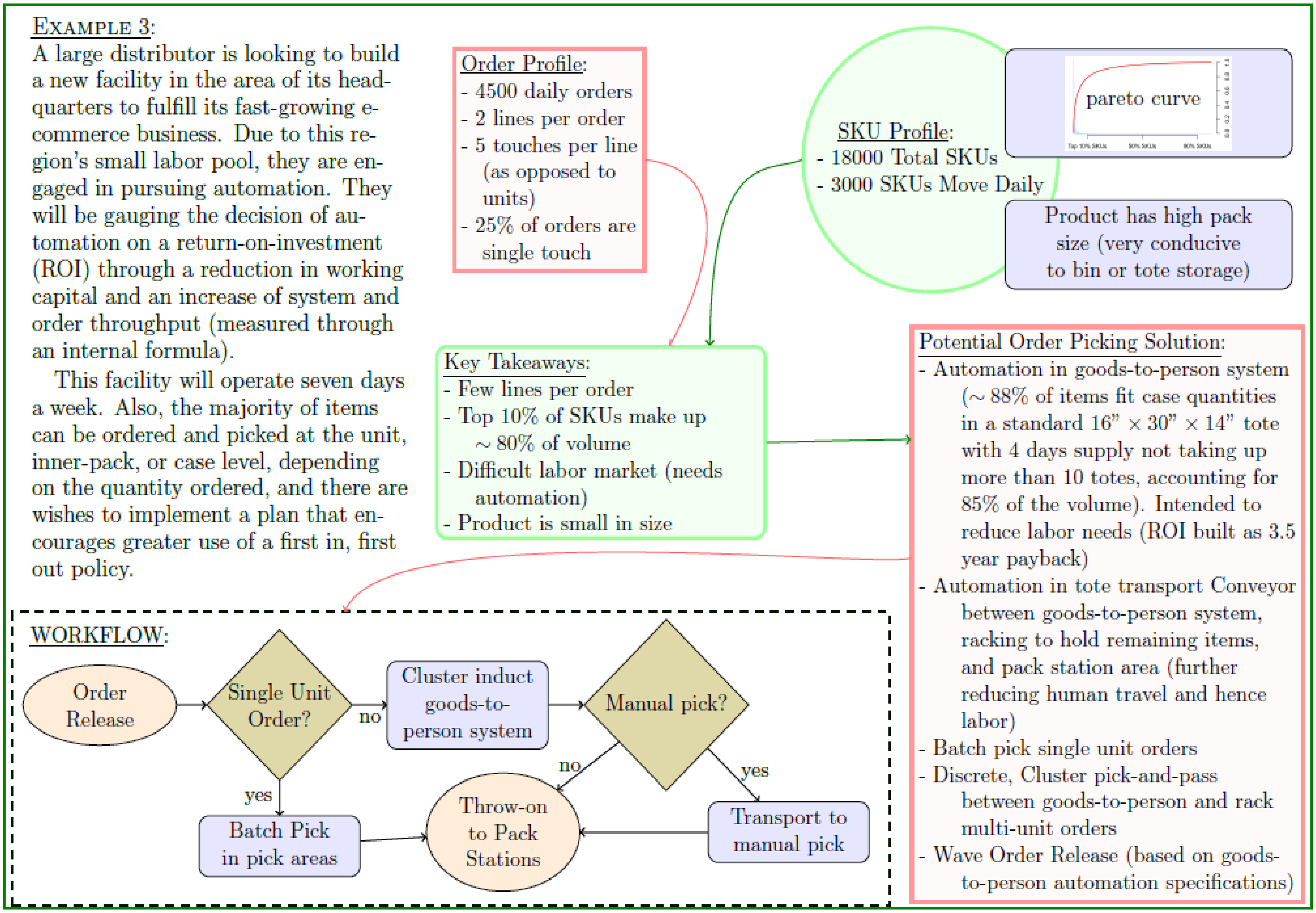
5% of items are non-conveyable (5% of lines)



Key Takeaways:
- Omni-channel business requires separate order picking methods
- Product Complexity may create need to mix order picking techniques
- Client interest capped by corporate budget

Potential Order Picking Solution:
- Piece and small case pick module with center conveyance line
  - Discrete, pick-to-tote for retail orders
  - Batch E-comm orders
- Case and large piece pick to pallet
  - Discrete pick retail orders
  - Batch pick E-comm orders
- Retail consolidation area (palletizing totes from piece pick mod)
- E-comm sort and pack area (single unit and ship-alone from case pick direct to pack stations, otherwise sort needed)
- Wave order release (conducive to retail orders)





CONCLUSION

Choosing an appropriate order picking solution is often over-simplified, but selecting an optimal one can help reach goals in increasing order volume, maximizing productivity, reducing labor, and speeding delivery time. Ensuring an optimal order picking solution helps the entire fulfillment operation succeed and, in turn, helps the entire supply chain meet consumer demand.

Beyond the elements themselves, the parameters at play, and the goals set to reach, realistically, choices have financial consequences that may limit the scope of potential opportunities. This capital expense, along with a potential need for return-on-investment (ROI), may help drive this business decision. Hence, there are many decisions to be carefully thought through in order to ultimately fit the right solution.

“Ensuring an optimal order picking solution helps the entire fulfillment operation succeed...”

With all the elements at play, navigating your way to the right order picking solution may seem overwhelming. Reaching out for help from the right professional group, the right integrator, can ease the stress, help make more informed decisions, and provide the needed difference in choosing what’s right for your organization.

Contact our experts at Hy-Tek Intralogistics for help!

Call us at 1-800-891-5504 or email us today at **info@hy-tek.com.**

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