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Fully Automated, Flexible Fulfillment

1+1=3: How To Unlock the Efficiency Your Fulfillment Center Needs

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eCommerce Growth & Labor Shortages Are Driving Automation

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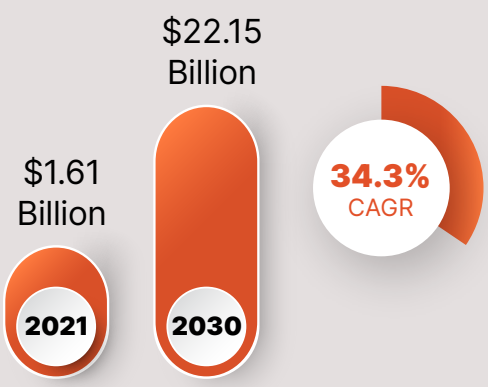
The growth of eCommerce and product assortment along with protracted labor challenges are driving demand for automation in fulfillment centers (FC) and distribution centers (DC).

eCommerce has permanently shifted the burden of order consolidation and fulfillment into the warehouse; whereas previously consumers implicitly acted as the pickers - walking around retail stores and manually consolidating their own orders - the shift towards eCommerce means this job increasingly needs to be done by paid labor in warehouses. The result is a vastly more complex and expensive supply chain, further aggravated by persistent labor challenges. In fact, according to surveys of logistics operators, finding and retaining labor has been the #1 challenge for warehouse operators since 2017 and a major challenge going back over a decade. As a result, FCs and DCs are embracing automation to alleviate some of these pain points and increase order accuracy, throughput, and efficiency. Automation has gone from a nice-to-have to a necessity.

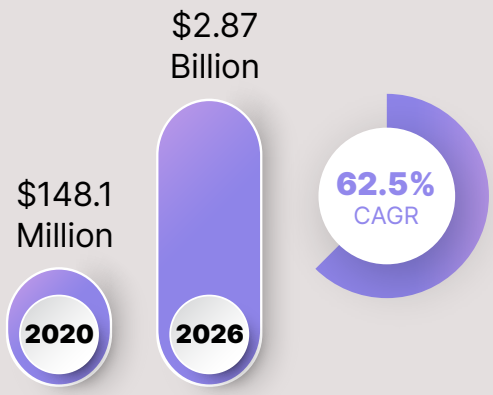
One of the most innovative automation technologies to emerge in the past decade have been Autonomous Mobile Robots (AMRs), which are expected to become a $22 billion market by 2030, and robotic piece picking arms, forecast to reach $2.9 billion in US sales by 2026.

Autonomous Mobile Robots (AMRs) Market



Source: Next Move Strategy Consulting

Robotic Arm Market



Source: Mordor Intelligence

Islands of Automation

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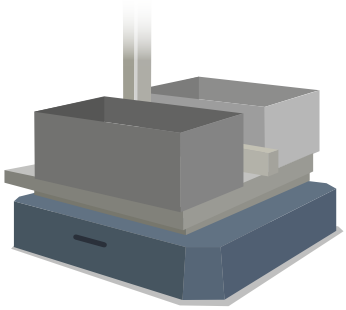
A critical challenge facing automation customers today is combining these two technologies into a single seamless solution.

1 **Autonomous Mobile Robots (AMRs)**



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1 **Robotic Picking Arms**

= THREE

AMRs and robotic picking arms are typically implemented as standalone technologies by different vendors, addressing specific tasks within the order fulfillment process but not working in tandem all of the time. This creates islands of automation - each technology providing significant value, but lacking the efficiency made possible only with a fully-integrated solution. By intelligently combining these isolated islands of automation into a cohesive, end-to-end solution, FCs and DCs can unlock large efficiency gains, significantly reduce labor intensity and gain a competitive advantage in the marketplace. Let's take a look at each of these point solutions in more detail.

AMRs & G2P AGVs

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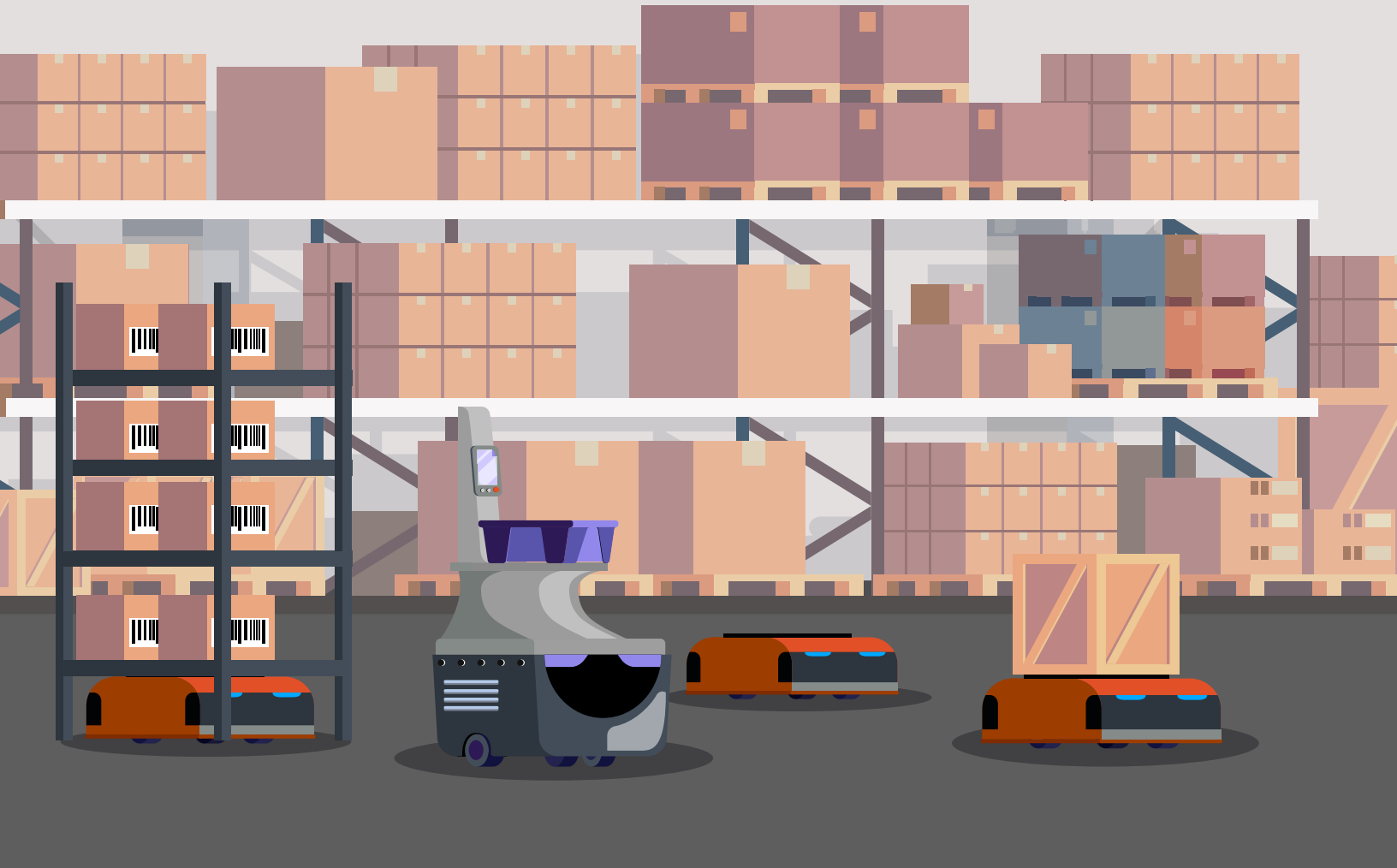
There are two main ways in which FCs and DCs use AMRs for robot-assisted picking.

In a 'meet me' or 'follow me' person-to-goods (P2G) model, AMRs meet humans inside the storage area. The humans pick items directly from the shelves or totes and place them onto the AMRs, which consolidate the order autonomously from one human picker to another. While this solution increases accuracy and decreases walking time throughout a facility and achieves pick rates of 130-140 UPH per human picker (roughly double that of cart-operated picking), it's still heavily reliant on human labor, on average requiring 3-4 human pickers per AMR, and does not automate replenishment.

In a goods-to-person (G2P) system, mobile robots move racks of merchandise to stationary human pickers, who then take the totes from the racks to pick individual items. This has the added benefit of increasing pick rates (to 350-400 UPH per human picker) and accuracy, but still relies on humans to do the picking, with robotic picking directly from the racks not feasible or practical given the need to first unload the tote manually from the rack.



Robotic
Piece Picking

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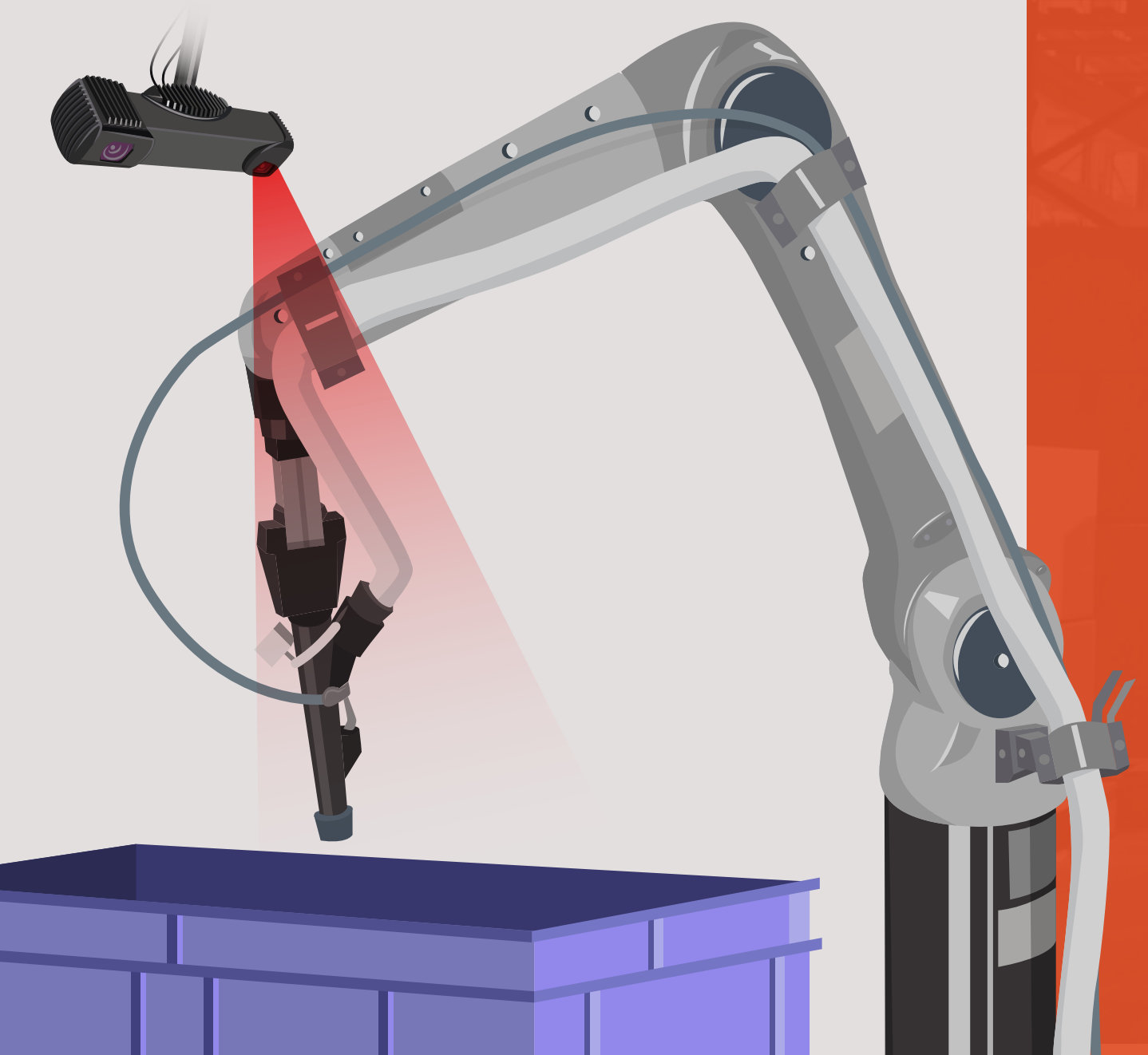
One way FCs and DCs have looked to gain a competitive advantage within automation is through robotic picking. Using 3D vision (the eyes) and AI (the brain), robotic picking arms identify the item with the highest probability of a successful pick and calculate the optimal picking depth and angle.

Advancements in AI have broadened the range of pickable items to also include previously unseen items and have vastly increased accuracy and speed of robotic picking arms. But first, robotic picking stations need to be ‘fed’ the pieces they are picking.



Avoiding
Monument Creation

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Traditionally, robotic picking stations are fed using conveyors. However, these are not only expensive (at $1,500 per linear foot), but also act as a single point of failure within the picking operation - if any part of the conveyor breaks, the entire robotic picking operation will stop because it will not be supplied.

Conveyors also limit flexibility: they can't be easily moved or re-routed, and have a fixed capacity limit, effectively becoming a 'monument' inside the warehouse. This inflexibility can also be detrimental to FCs and DCs when they need to flex to accommodate seasonal fluctuations or changes in product offerings.

Replacing
Conveyors with AMRs

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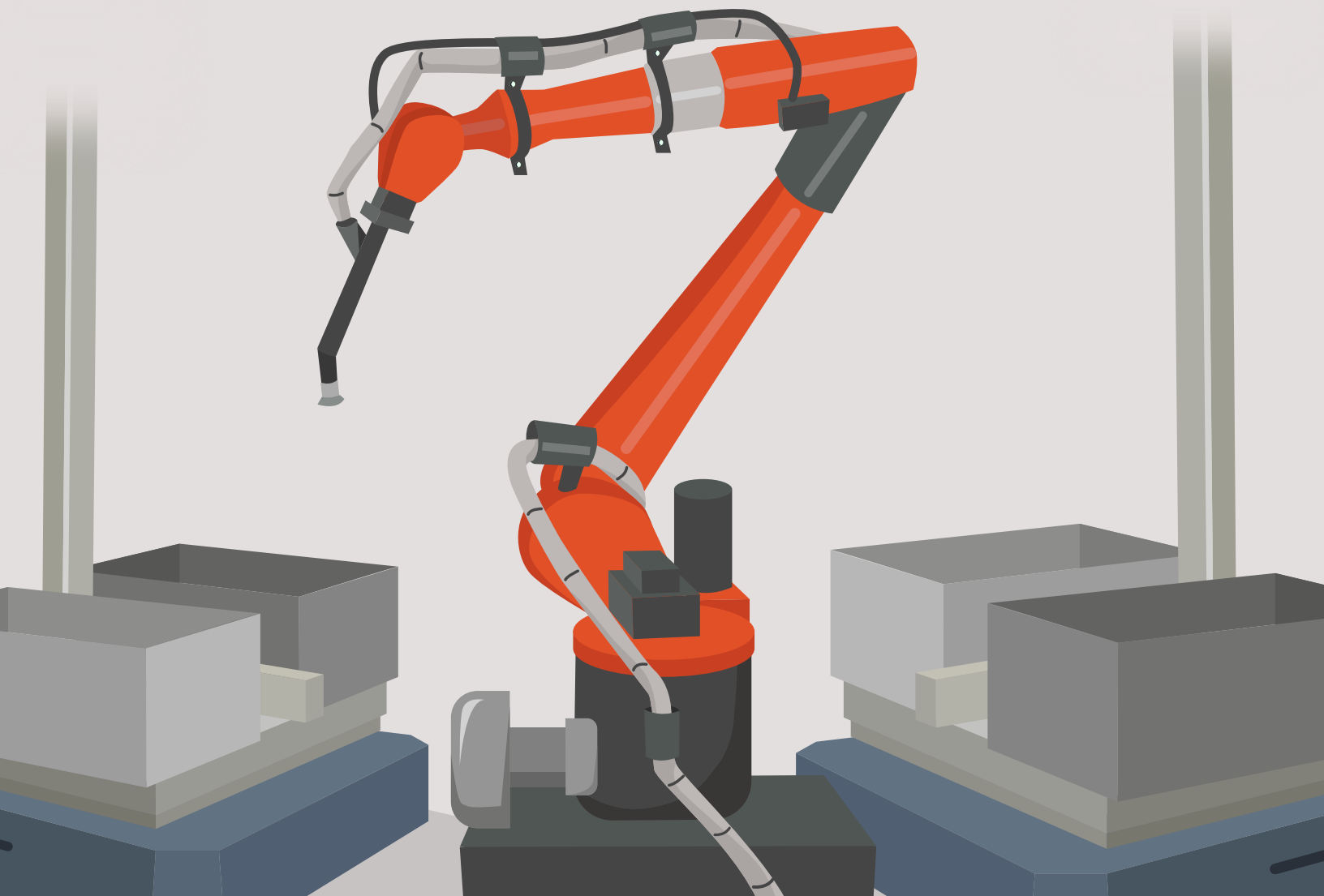
By combining robotic pickers with AMRs, FCs and DCs can bypass conveyors entirely and achieve integrated end-to-end automation, increase order throughput, and eliminate labor challenges while still retaining maximum flexibility.

AMRs equipped accordingly can autonomously move totes both on and off standard shelves, enabling not only automated retrieval of storage totes to robotic picking stations, but also fully autonomous replenishment.

AMRs are significantly less expensive to implement than conveyors, have no single point of failure, and do not physically split warehouses into different areas like conveyors. In addition, AMRs provide the flexibility needed by eCommerce to accommodate peak seasons (by temporarily adding additional AMRs) and 3PLs to accommodate changing end-customer requirements (as AMRs can easily adapt to reconfigured layouts).



Picking
the Unpickables

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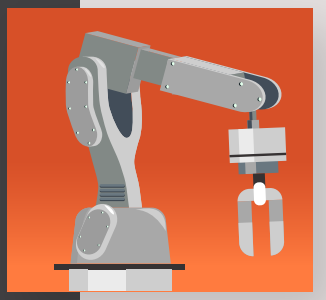
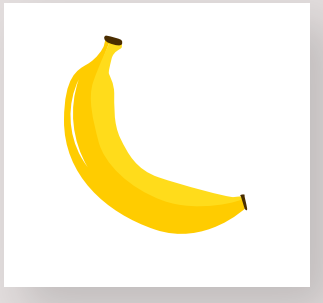
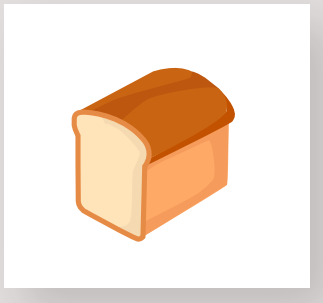
Not all SKUs are pickable by robotic picking arms due to weight, size, or even shape restrictions. Typically robotic picking stations can pick 70-90% of SKUs, although this could be higher or lower depending on the industry.

As a result, to really scale robotic picking, operators need to retain the flexibility to efficiently handle these unpickable edge cases. The solution is to implement a goods-to-person (G2P) station alongside robotic picking or goods-to-robot (G2R) stations, allowing the AMRs to alternate between G2R and G2P picking stations when needed.

These G2P stations would differ from the aforementioned typical G2P stations as the AMRs would transport individual totes instead of entire racks. There should also be much fewer G2P stations (and associated human pickers) than G2R stations as the bulk of the picking would still be performed by robotic pickers.







Optimization & Orchestration

Software is key to integrating point solutions like AMRs and robotic pickers and unlocking their full potential.

The single biggest efficiency factor in fulfillment operations is the cycle time between picks, which is predominantly determined by the distance traveled by humans or AMRs to retrieve stored items (travel time is estimated to account for ~50% of all operating costs in fulfillment warehouses). Path planning optimization minimizes the distance traveled by AMRs to consolidate an order (known as the 'traveling salesman problem'), reducing cycle time and, as a result, the number of AMRs needed and the cost. Consolidating orders on the AMRs themselves and distributing robotic picking stations across optimal locations inside the storage area, as opposed to a single location on the boundaries, would cut distances and cycle times even more.

In addition, the software must run processes such as collision avoidance and path prioritization in real time, as well as autonomously choose between G2R and G2P stations for a given item. While most WCS/WES/WMS software has traditionally orchestrated equipment and managed the flow of materials within FCs and DCs, the deployment of more advanced robotic solutions means software capabilities must evolve or be supplemented by purpose-built software that optimizes picking and orchestrates the robotic and G2P solutions into a single, cohesive system.

Wrapping It Up

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So what do you get when you combine AMRs and robotic picking? A fully automated, end-to-end robotic fulfillment operation, covering replenishment, retrieval, picking, and consolidation in a single integrated solution.

Such a solution would use 95% less labor than P2G solutions and 90% less than G2P solutions. It would require no 'monument' creation, and the optionality offered by integrating human picking alongside robotic picking means one would retain the same level of flexibility and product coverage as with any AMR-supported human pick operation.

The First Pick in Fully Automated Fulfillment

Brightpick is an end-to-end fulfillment solution that enables 3PLs, eCommerce, and eGrocers to fully automate their operations in a matter of weeks. Brightpick combines state-of-the-art AMRs, robotic picking stations using best-in-class 3D vision with advanced AI algorithms, and advanced optimization and orchestration software, all developed entirely in-house. Brightpick is easily reconfigurable and scalable, and has no single point of failure.

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