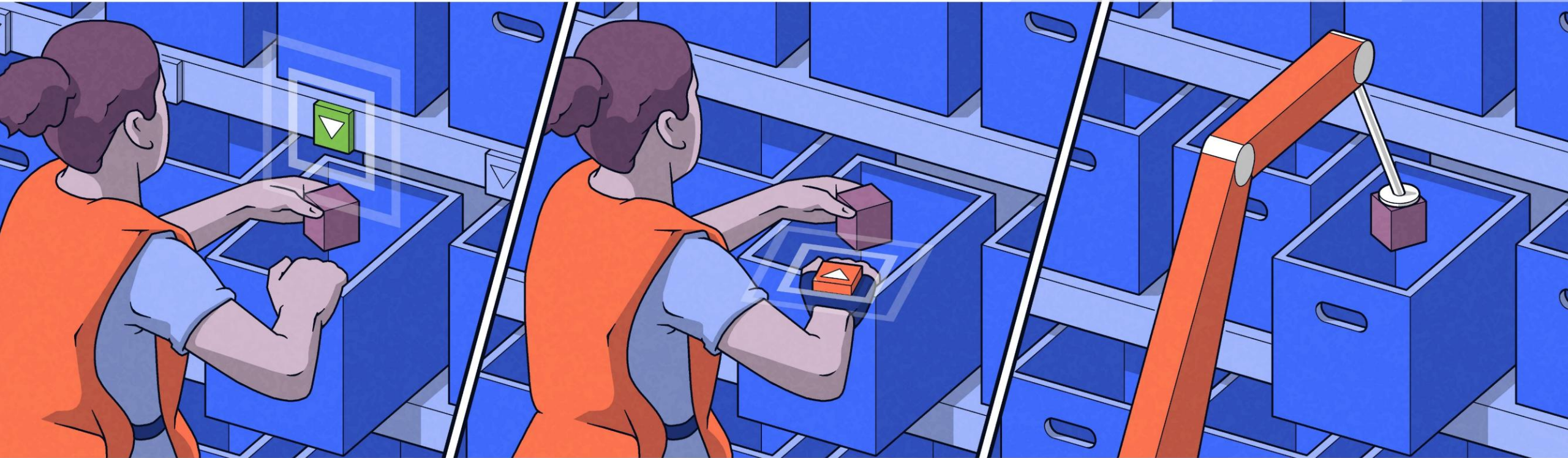


# PICKING AUTOMATION 2025

PICK TO LIGHT | VOICE PICKING | WEARABLES | PICKING ROBOTS | SEP 2025



Picking Automation, Aug 2025  
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# EXEC SUMMARY: PICKING TECHNOLOGIES ADVANCING. MOMENTUM BUILDING FOR ROBOTICS EACH + CASE PICKING. INCREASING WAREHOUSE DIGITIZATION

## WAREHOUSE PICKING PROCESSES

- Picking frequently refers to the order fulfillment process, but often covers the entire journey through a warehouse, from in- to outbound
- Fulfilment picking (incl. decant & storage) represents c.52% of warehouse operation costs and is often one of the first processes to get automated

## WAREHOUSE PICKING TECHNOLOGIES

- STIQ views picking technologies and automation along a grey scale, from fully manual to fully automated
- Manual picking technologies refer to equipment such as handheld and/or bodyworn AIDC equipment ('barcode readers'), stationary Pick to Light (PTL) equipment, Software Directed Picking (incl. Voice and other routing software)
- Manual+ increasingly features PA-AMR type mobile robots that assist pickers, often equipped with or linked to/with AIDCs
- Automation mainly includes robot picking but overlaps with storage and mobile robots used for transportation only (storage is covered in other STIQ reports – [download here](#))

## MATURITY OF TECHNOLOGIES

- Technologies, such as AIDC and PTL are relatively well established although there are incremental developments for each

- AIDC (handheld/bodyworn) are typically replaced every 3 years while PTLs tend to be stationary
- Picking robotics and software directed picking are relatively new developments
- Eaches robot picking solutions (stationary robot arms) were introduced in the mid 2010's and have begun to experience improved commercial traction post-Covid
- Case robot picking solutions (combination mobile robot + picking arm) are a relatively recent addition to the sector and remain nascent with a growing vendor landscape (see also case handling in [STIQs Loading & Unloading Automation reports](#))
- There are also increasing exploration of humanoids in a variety of form factors which remain at trial level
- Furthermore, note some mobile robots, such as PA-AMRs, often come equipped with AIDC devices for robot-human collaborative processes

## CASE & EACHES TECH DIFFERENCES

- While manual Case and Eaches handling often deploy the same equipment, such as AIDC, PTL, voice, etc., automation equipment is often different between the two payloads
- Eaches picking robots are typically deployed at ASRS pick or put-away ports, while Case picking robots tend to be based on mobile robots, roaming aisles with a pallet attachment

## INCREASING WAREHOUSE DIGITIZATION

- Warehouses and fulfilment processes are increasingly digitized with growing potential for operators to analyze and identify chunks of improvements
- As a result, handheld and bodyworn equipment is evolving with improved tracking and analysis capabilities – already inherent in most robotics applications
- In combination with the evolution of many warehouse software packages, this is likely merging into a growing uptake of digital twins and simulation capabilities

**FOR BUYERS OF PICKING AUTOMATION EQUIPMENT: STIQ offers a free 30min debrief/Q&A session for this report as part of the sponsorship. Contact us to arrange a confidential “ask us anything” session**

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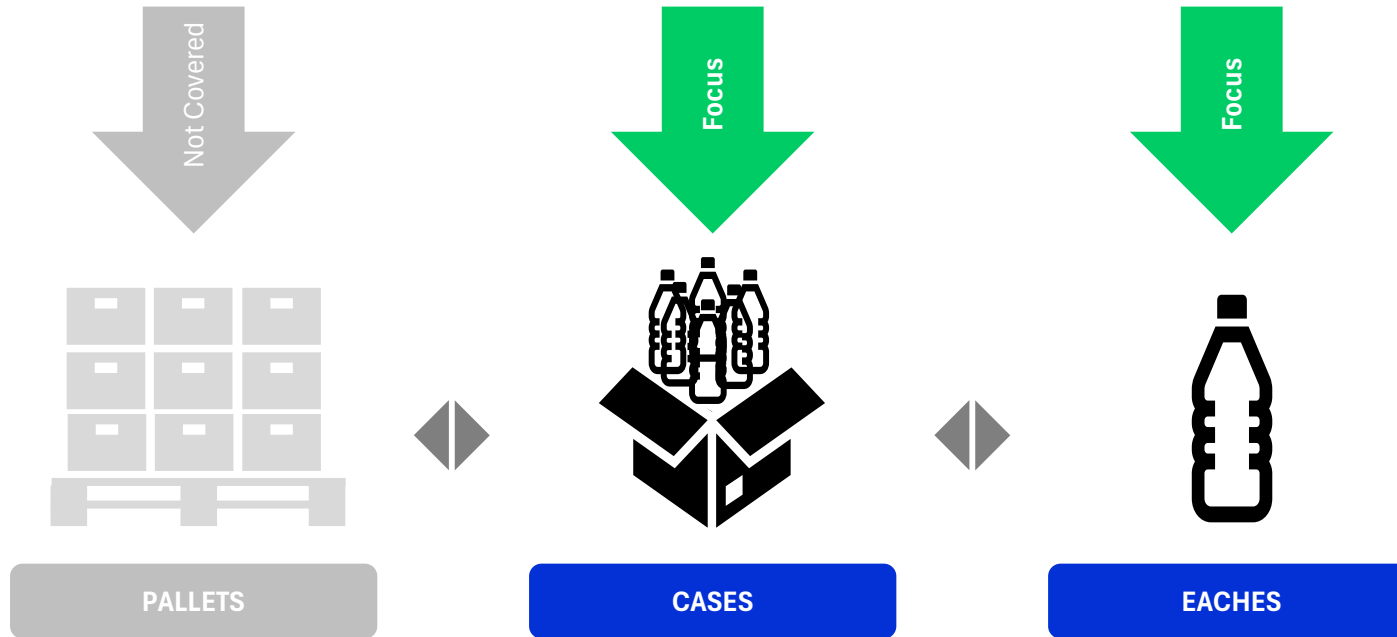


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<b>CONTENTS</b>	<b>PAGE</b>
<b>EXECUTIVE SUMMARY</b>	2
<b>▶ MARKET INTRODUCTION &amp; SEGMENTATION CASES VS EACHES PICKING</b>	3 10
<b>MARKET GROWTH</b>	15
<b>PICKING TECHNOLOGIES</b>	20
<b>MANUAL+ (AIDC, PTL, SOFTWARE, ETC.)</b>	22
<b>ROBOT PICKING (EACHES)</b>	31
<b>ROBOT PICKING (CASES)</b>	39
<b>HUMANOID PICKING</b>	43
<b>SECTOR DEMOGRAPHICS</b>	46
<b>VENDOR DIRECTORY</b>	49
<b>CREDITS &amp; LIST OF INTERVIEWS</b>	55

# THIS REPORT FOCUSES ON CASES AND EACHES HANDLING PROCESSES IN WAREHOUSES INCLUDING PICKING AND SCANNING

## THREE MAJOR PAYLOADS IN WAREHOUSES – PALLETS, CASES AND EACHES



## PAYLOAD FOCUS FOR THIS REPORT

- Warehouses handle three primary payload types – Pallets, Cases and Eaches (aka ‘units’)
- This report focuses on Cases and Eaches
- Pallets tend to be handled with forked vehicles, pump trucks, forklifts, etc. and are out of the scope of this report

## CASES & EACHES FULFILLMENT MERGING

- While Cases (and Pallets) are more frequently associated with wholesale (B2B) activities and Eaches with ecommerce (D2C/B2C) fulfillment, there are growing overlaps and grey areas
- Plenty of legacy picking technologies have been applied to both Cases and Eaches applications with more recent picking solutions frequently targeting a single payload (or form factor)

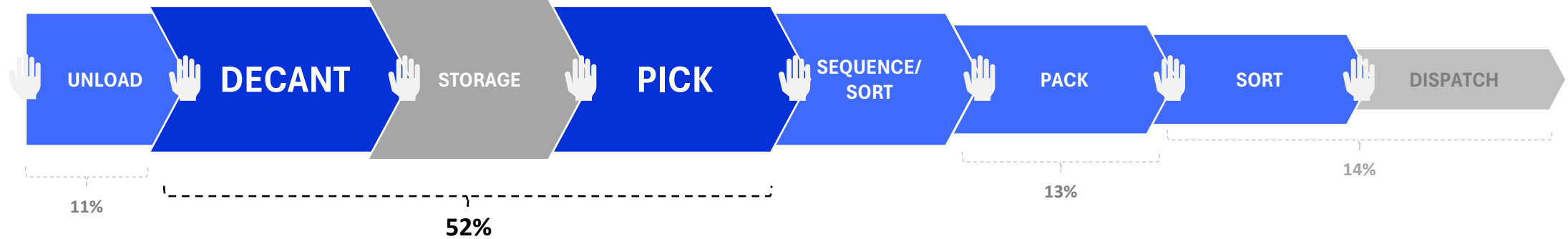
- All goods placed on pallet
- Palletization may occur at end of line at domestic factories or in warehouses when unpacking containers, etc.
- <100s SKUs at factory (often far less)

- Typically X-number of Eaches in a Case, often direct from factory or wholesale distribution
- Associated with wholesale fulfillment to stores and/or other B2B customers
- 100-1,000’s of SKUs at wholesale warehouses

- Smallest single unit
- Associated with ecom and/or B2C fulfillment
- Increasingly also in B2B fulfillment
- 1,000-100,000+ SKUs at B2C fulfillment warehouses

# GOODS ARE HANDLED MULTIPLE TIMES IN THE WAREHOUSE PROCESSING FLOW. DECANT & PICK REPRESENTS 52%<sup>1</sup> OF MANUAL WAREHOUSE ACTIVITY COSTS

## [NON-AUTOMATED] WAREHOUSE ACTIVITIES AS A SHARE OF WAREHOUSE COSTS (%)



Key: = Manual handling/touches

Other activities represent 10% e.g. Stock counting, Value Added Services, etc.

Source: STIQ Ltd Research & Analysis. Representative costs, Silesian University of Technology via Researchgate ([link](#))

Note: For STIQ reports focusing on Storage, ASRS, G2P/P2G, etc. – download STIQs [G2P Solution reports](#)

<sup>1</sup> May vary depending on type of payloads, customer, processes, etc.

### COST OF MANUAL HANDLING PROCESSES

- In an average manual operated warehouse, costs can be broken down into various labor activities (see above)
- In a 2017 study, researchers found that just over 50% of warehouse activity costs are typical fulfilment processes associated with Put-away/Decant, Storing and Picking ([source](#))
- This may vary for individual warehouse operators depending on multiple variables, such as warehouse design, salaries, product/payload types, layouts, software used, number of shifts, SLAs, etc.

### EVERY TOUCH ADD COSTS

- Depending on industry, goods types, if its B2B and B2C fulfilment, etc. there can be as many as 10-15x manual touches from goods-in to goods-out (see also the hands in the illustration above for an idea)
- Each manual handling (or touch) adds cost to goods which can become significant and add to margin pressures
- This also includes returns management, which is not included in the above illustration

### B2C + B2B AND PAYLOADS MERGING

- Warehouse operators are increasingly managing fulfillment across multiple channels with multiple different payloads- Eaches, Cases and pallets

**“They have e-commerce channel that they support from their facility and then they also have their direct-to-store business, which, from an order profile standpoint, looks identical to ecom in terms of the number of units per line and the number of lines per order. From a technological standpoint, you have to handle it the exact same way. A lot of the lines are blurring between store fulfilment and ecom.” [Exotec]**



# EVERY PICK IS ACCOMPANIED BY A CONFIRMATION SCAN OF A BARCODE OR OTHER IDENTIFYER, SUCH AS AN RFID TAG

## EVERY PICK ALSO INCLUDES A SCAN

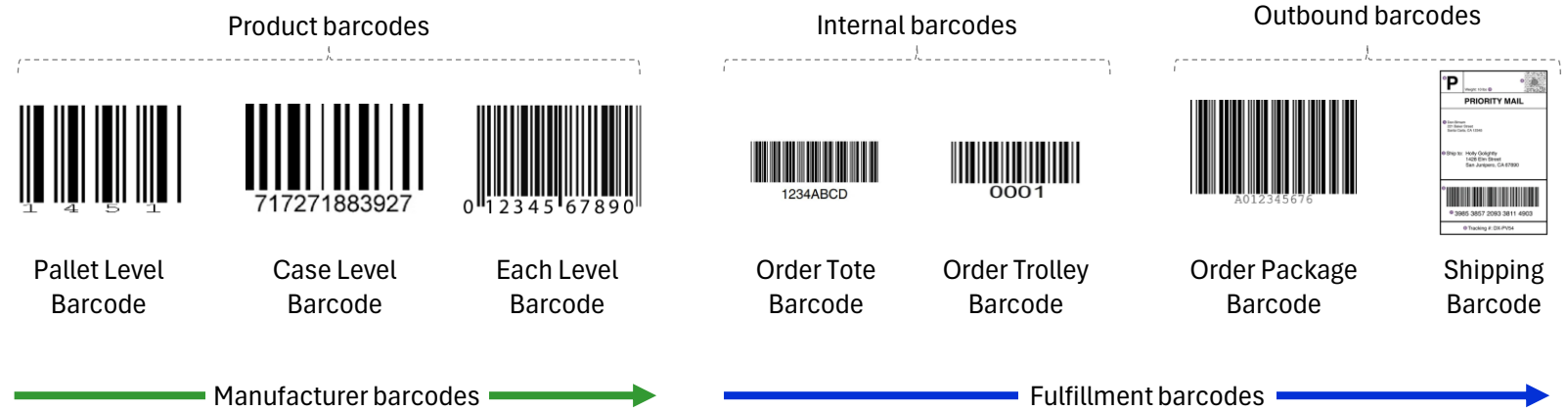


Image source: ProGlove

## A BARCODE SCAN WITH EVERY PICK

- Every pick is followed by a scan to confirm the correct item was picked and multiple barcodes may be scanned as a part of the process
- In a warehouse which manages all three payloads (Pallets, Cases, Eaches) there will be a different barcode for each payload
- Depending on the warehouse flow, there may be additional barcodes to identify order totes and order trollies used to fulfill orders

## FULFILLMENT BARCODE JOURNEY (SIMPLIFIED, ILLUSTRATIVE)



Source: STIQ Ltd Research & Analysis

- Finally, there are also a few barcodes for outgoing goods, including an order package barcode and a shipping label, which itself potentially incorporates a variety of barcodes depending on the carrier used to ship a package

## BARCODE SCANNER FORM FACTOR VARIATION

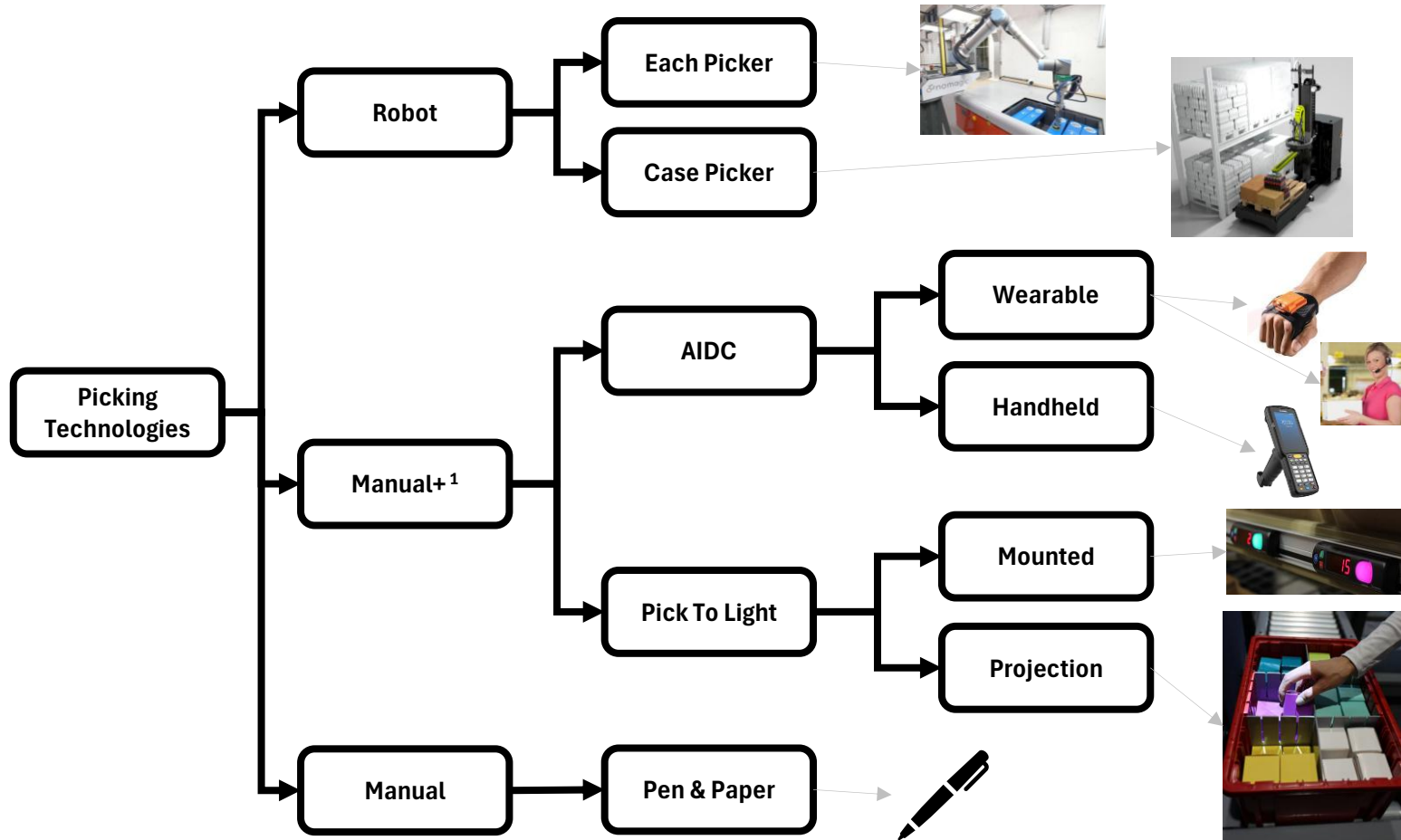
- Barcode scanning is an AIDC technology that has been around since the 1970s and is widely adopted in warehouses (and other sectors)
- Other AIDC technologies include RFID, QR Codes, Magnetic Strips, etc.

- Barcode scanning is the most widely used AIDC technology and there are a large number of different scanners that can be used to collect data
- Manual labor typically uses mobile handheld and/or wearable scanners but may also utilize stationary scanners (typically at packaging station, fixed to mobile robots, etc.)
- Wearable scanners have been gaining traction in recent decades and have become far more ergonomic in their design



# THERE ARE PLENTY OF PICKING TECHNOLOGY OPTIONS FROM MANUAL TO MANUAL+ TO ROBOT PICKING

## OUTLINE OF PRIMARY PICKING METHODS (SIMPLIFIED)



## MULTIPLE TECHNOLOGY OPTIONS

- Picking technology options vary from stationary to mobile to automated with the choice of technology relevant to the activity or process undertaken in warehouses
- For example, manual pickers in an aisle will most likely use mobile/wearable scanners while a packaging station may use stationary scanners
- Pick to Light and other light directed options tend to be used on shelves (aka put and/or pick faces) to direct the attention of a picker
- Automated solutions may be deployed to augment human picker processes

## DRIVERS FOR CHOICE

- Drivers for technology choices vary, but tend to focus on picking accuracy, cost and speed of processing
- Other drivers may influence technology choices, such as picking strategy, existing infrastructure, warehouse layout, etc.

Source: STIQ Ltd Research & Analysis

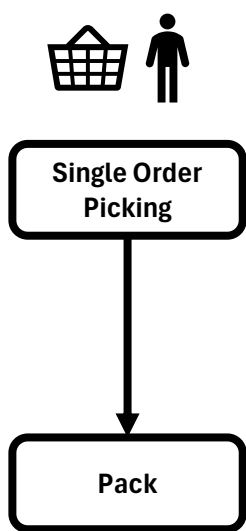
Image source: Nomagic, Matthews, ProGlove, Solwr, Zebra

<sup>1</sup>Primarily Software Directed Labor (SDL)

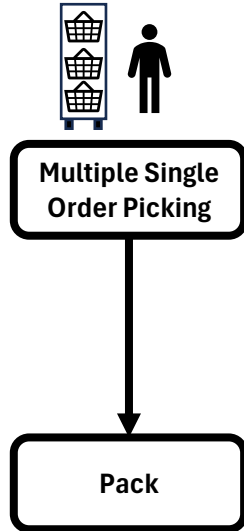


# PICKING (FULFILLMENT) STRATEGIES MAY VARY DEPENDING ON MULTIPLE FACTORS: TYPE OF PAYLOAD, LINE ITEMS PER ORDER, SIZE & WEIGHT OF ITEMS, ETC.

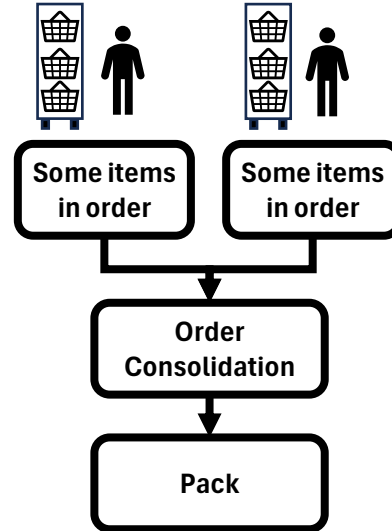
## COMMON PICKING STRATEGIES (HIGHLY SIMPLIFIED)



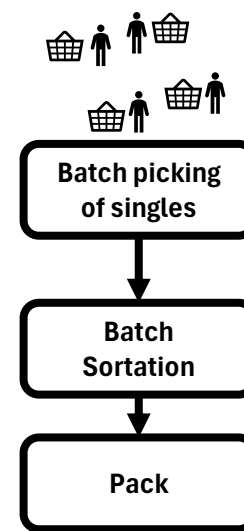
- Single order pick is frequently used where orders need to go out for delivery quickly
- For example, Quick Commerce grocery orders tend to be picked 1:1
- This can also be used in case (wholesale) fulfillment warehouses due to physical size of orders



- Multiple Single Order Pick is common in many warehouses
- A single picker is pulling a trolley with 10-40 orders
- This is frequently also a picking strategy with ASRS G2P systems



- Zone picking is a strategy where pickers focus on picking items in a particular zone or set of aisles
- This means orders have to be consolidated at some point



- Batch picking is common strategy especially with lower line items per order
- Pickers add items in the same basket which means time for additional scans is saved
- Items may go through a batch sortation machine into single orders
- For single item orders, delivery may be directly to packing

## PICKING STRATEGIES

- The choice of picking strategy employed in a fulfillment scenario may be influenced by several factors, from SLAs to product range, order profiles, etc.
- The picking strategy often influences the choice of technologies
- For example, in a Quick Commerce scenario, operators may favor a 1:1 order picking & fulfillment strategy as customers are paying a premium price for quick delivery
- A warehouse with primarily single item orders (someone selling mobile phones for example) may opt for a singles batch picking strategy to optimize the flow through the warehouse
- Other warehouse operators may opt to use a single picker with a cart and 40 open orders to walk through the entire warehouse and fulfill each order
- Furthermore, some companies may combine strategies, for example if they have a large proportion of single item orders where they do batch picking with a different strategy for multi-item orders



# DIFFERENT PICKING STRATEGIES MAY INVOLVE A VARIETY OF TECHNOLOGIES

## PICKING STRATEGIES DEFINED (SAMPLE LIST, NOT EXHAUSTIVE)

PICKING STRATEGY	DESCRIPTION	TECH INVOLVED*
Batch	<ul style="list-style-type: none"> <li>Items for multiple orders are picked together in one trip, then sorted into individual orders later</li> </ul>	<ul style="list-style-type: none"> <li>AIDC, PTL, Robotics</li> </ul>
Bucket-Brigade	<ul style="list-style-type: none"> <li>Pickers are arranged in a line or sequence, and the order moves along that line</li> <li>Each picker is responsible for a segment of the picking process</li> </ul>	<ul style="list-style-type: none"> <li>AIDC</li> </ul>
Multiple Single Order (Cluster)	<ul style="list-style-type: none"> <li>Picker handles several orders at once, carrying items in separate containers (trolley, AMR, or put-wall support)</li> </ul>	<ul style="list-style-type: none"> <li>AIDC, PTL, Robotics</li> </ul>
Parallel	<ul style="list-style-type: none"> <li>Multiple pickers (or robots) work on the same order simultaneously</li> </ul>	<ul style="list-style-type: none"> <li>AIDC, PTL, Robotics</li> </ul>
Pick-to-Box	<ul style="list-style-type: none"> <li>Items picked directly into shipping boxes, reducing extra handling</li> </ul>	<ul style="list-style-type: none"> <li>AIDC, PTL, Robotics</li> </ul>
Pick-to-Buffer	<ul style="list-style-type: none"> <li>Items picked and placed into a temporary buffer area before final order assembly</li> </ul>	<ul style="list-style-type: none"> <li>AIDC, Robotics</li> </ul>
Relay	<ul style="list-style-type: none"> <li>Orders passed between zones, workers, or robots combining zone and time-based handoffs</li> </ul>	<ul style="list-style-type: none"> <li>AIDC, PTL, Robotics</li> </ul>
Single Order	<ul style="list-style-type: none"> <li>Picker handles one order picked at a time, common for fast delivery</li> </ul>	<ul style="list-style-type: none"> <li>AIDC, PTL</li> </ul>
Wave	<ul style="list-style-type: none"> <li>Orders are grouped into scheduled batches (waves) for picking and release at set times</li> </ul>	<ul style="list-style-type: none"> <li>Software (WMS, WES)</li> </ul>
Waveless	<ul style="list-style-type: none"> <li>Orders are continuously released in real time, keeping work flowing without fixed waves</li> </ul>	<ul style="list-style-type: none"> <li>Software (WMS, WES)</li> </ul>
Zone	<ul style="list-style-type: none"> <li>Pickers work in a designated warehouse zone, the orders are consolidated after items are collected from all zones</li> </ul>	<ul style="list-style-type: none"> <li>AIDC, PTL, Robotics</li> </ul>

## DRIVERS OF PICKING STRATEGY

- There is a wide variety of picking strategies often influenced by multiple factors and variables, such as product characteristics, including size, weight, range, handling requirements, SKU velocity, etc.
- Warehouse layout, design and any availability of automation can also influence which strategy is the most efficient
- The chosen picking strategy typically determines picking technologies applied and how they are combined in practice
- Applicable picking technologies include AIDC (handheld/body worn scanners), Pick to Light, and Software Directed Picking (incl. Voice), Robot Picking, etc.
- Adding automation, processes or new (different) SKUs may require a company to switch picking strategy or picking layouts, etc.

Source: STIQ Ltd Research & Analysis

\* See glossary list for acronyms



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<b>CONTENTS</b>	<b>PAGE</b>
<b>EXECUTIVE SUMMARY</b>	2
<b>MARKET INTRODUCTION &amp; SEGMENTATION</b>	3
<b>CASES VS EACHES PICKING</b>	10
<b>MARKET GROWTH</b>	15
<b>PICKING TECHNOLOGIES</b>	20
<b>MANUAL+ (AIDC, PTL, SOFTWARE, ETC.)</b>	22
<b>ROBOT PICKING (EACHES)</b>	31
<b>ROBOT PICKING (CASES)</b>	39
<b>HUMANOID PICKING</b>	43
<b>SECTOR DEMOGRAPHICS</b>	46
<b>VENDOR DIRECTORY</b>	49
<b>CREDITS &amp; LIST OF INTERVIEWS</b>	55

# SIMILAR TOOLS IN MANUAL AND MANUAL+ EACH & CASE PICKING. WHILE SOME AUTOMATION OVERLAPS THEY TEND TO DIVERGE RAPIDLY

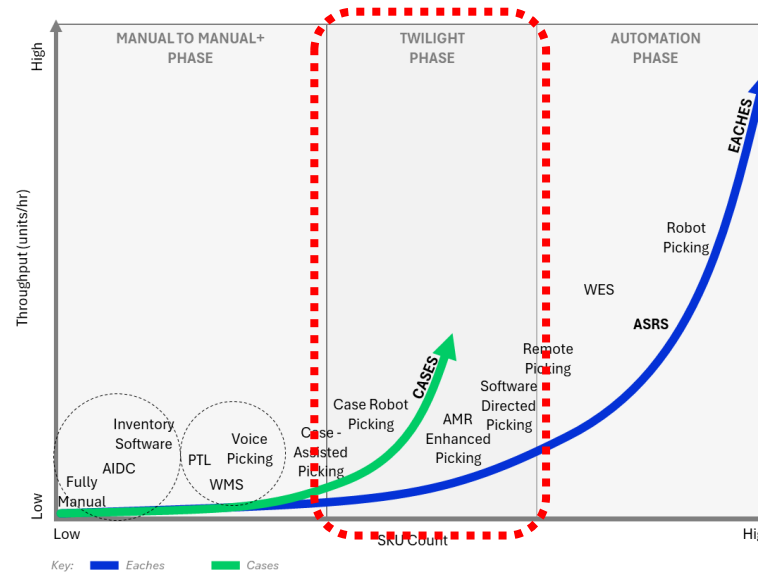
## EACH & CASE PICKING TECH SIMILAR

- Each and Case picking follow largely the same kind of picking and scanning processes initially
- Picked goods are typically added to an order tote for Eaches whereas a case order may be assembled on a pallet
- However, very similar picking technology is deployed including a variety of AIDC, possibly PTL (less likely for case picking) and picker routing (Software Directed Picking)
- Another difference is that a typical 'each picking warehouse' holds far more different SKUs when compared to a case picking warehouse

## TECH DIVERGENCE AT AUTOMATION

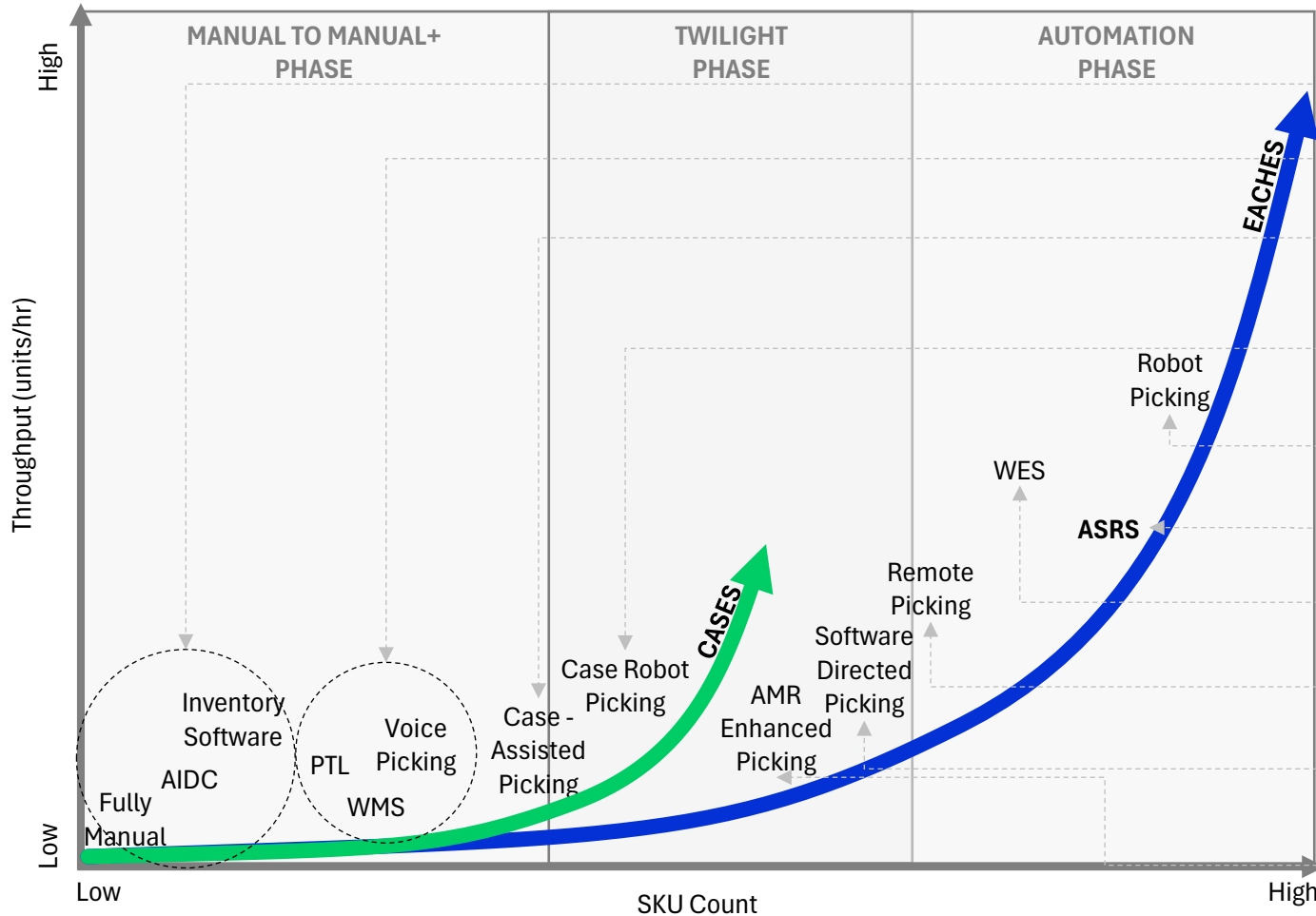
- While manual processes look similar from a picking technology view, they quickly diverge as the processes are increasingly automated
- There is a twilight phase where some technologies can be used for case and each picking, but as volumes build up, such tech may have to be replaced
- Case picking tends to be bulkier and requires different automation capable of storing a higher payload which may include palletized goods
- Case picking robots are relatively new and may include a picking arm on a mobile base which roams aisles picking from racking
- Each picking robot tends to be deployed at ASRS picking stations and rarely roams aisles

## PICKING TECH DIVERGENCE AT AUTOMATION



# EACH AND CASE PICKING TECHNOLOGIES DIVERGE QUICKLY AS EQUIPMENT IS AUTOMATED

PICKING OPTIMISATION DEVELOPMENT (SIMPLIFIED)



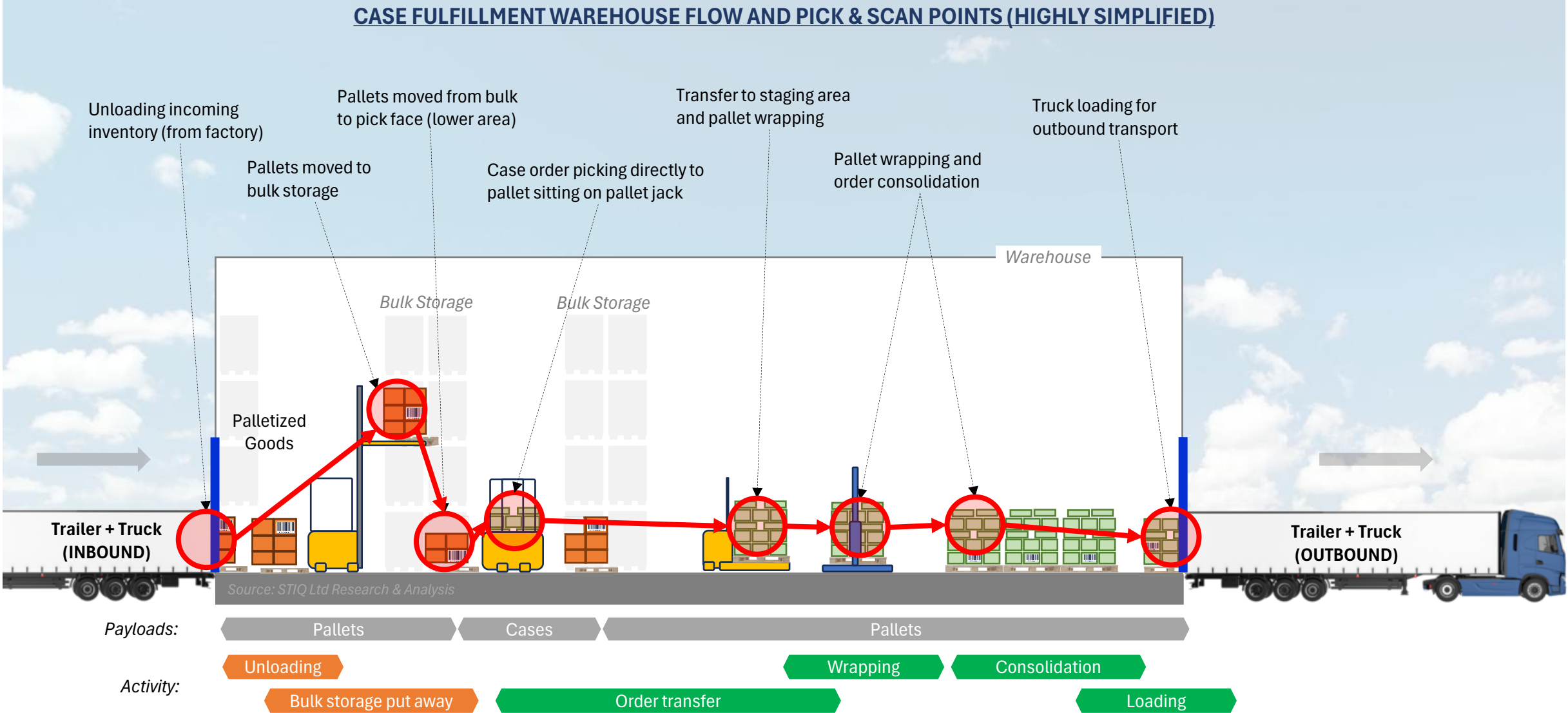
Key: █ Eaches █ Cases Incumbent technology Nascent technology

- Standard picking solutions used extensively for improving throughput, accuracy, management.
- Manual+ technologies to further improve warehouse processes and management
- Assisted Picking (Case) is a remote-controlled pump-truck that moves as the picker moves in the aisle. Modification of existing tech
- Case Robot Picking is at a nascent stage and revolves around two primary use Cases (excl. palletization): Order picking and Container/Truck Unloading/Loading
- Eaches Robot Picking is an emerging technology that frequently relies on an ASRS already being installed
- An ASRS (or G2P Solution) is often a primary solution once SKUs and volumes outgrow operations
- A WES tends to be used where there is pre-existing automation equipment, such as mobile robots, conveyors, ASRS, etc.
- Remote Picking is a nascent segment related to humanoids (or hybrids) which are teleoperated from a remote location
- SDP is an emerging type of software used to map the route for pickers to the next pick location
- AMR enhanced picking tends to be P2G type applications where mobile robots take on transfers from picking areas to staging areas or a packing area



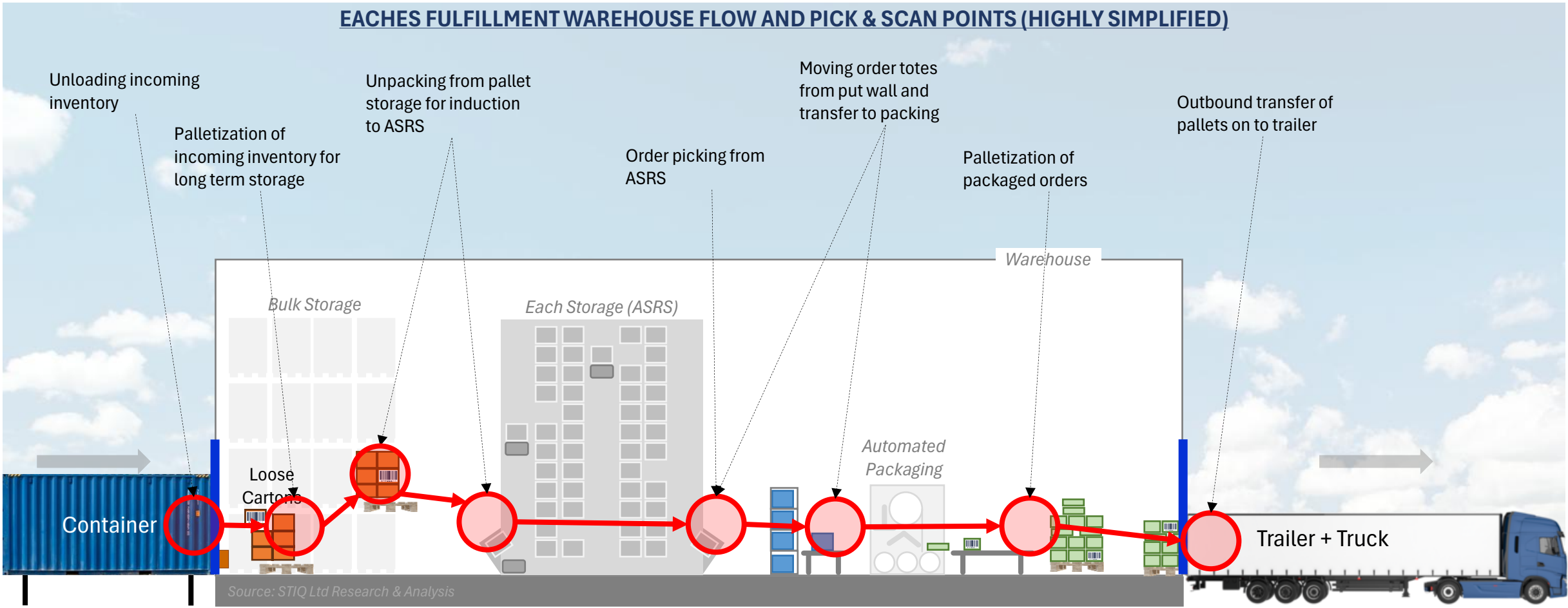
# CASES WAREHOUSE FLOW & ORDER FULFILLMENT TEND TO FOCUS ON FORKLIFT AND MANUAL HANDLING

CASE FULFILLMENT WAREHOUSE FLOW AND PICK & SCAN POINTS (HIGHLY SIMPLIFIED)



# EACHES WAREHOUSE FLOW & ORDER FULFILLMENT IS FREQUENTLY MANAGED WITH A COMBINATION OF TOOLS AND AUTOMATION/SEMI-AUTOMATION EQUIPMENT

EACHES FULFILLMENT WAREHOUSE FLOW AND PICK & SCAN POINTS (HIGHLY SIMPLIFIED)



Source: STIQ Ltd Research & Analysis

<b>Payloads:</b>	Cases & Pallets	Eaches	Cases & Pallets
<b>Activity:</b>	Unloading Palletization	ASRS induction	ASRS pick Put wall transfer
		Packaging	Palletization Loading



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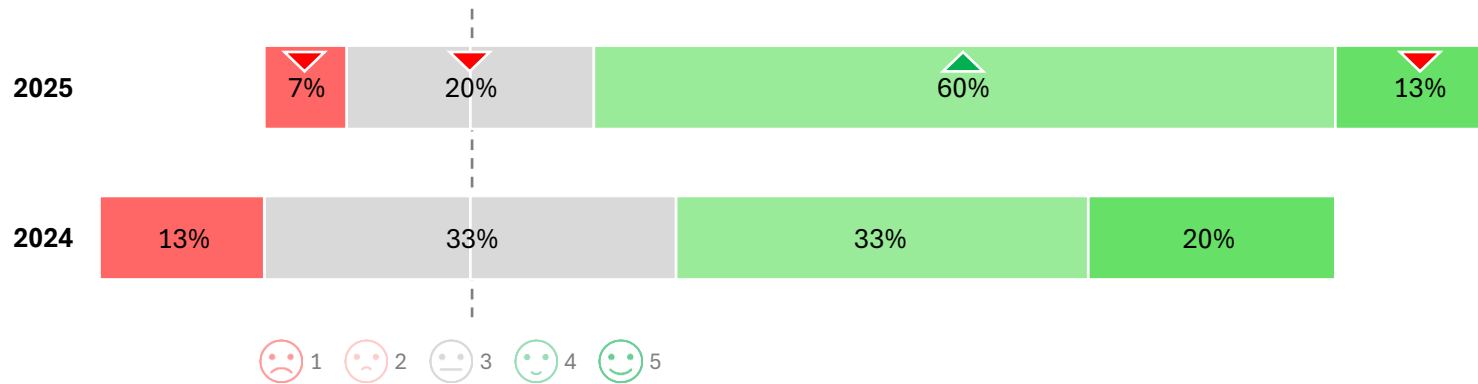


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<b>CONTENTS</b>	<b>PAGE</b>
<b>EXECUTIVE SUMMARY</b>	2
<b>MARKET INTRODUCTION &amp; SEGMENTATION</b>	3
<b>CASES VS EACHES PICKING</b>	10
<b>MARKET GROWTH</b>	15
<b>PICKING TECHNOLOGIES</b>	20
<b>MANUAL+ (AIDC, PTL, SOFTWARE, ETC.)</b>	22
<b>ROBOT PICKING (EACHES)</b>	31
<b>ROBOT PICKING (CASES)</b>	39
<b>HUMANOID PICKING</b>	43
<b>SECTOR DEMOGRAPHICS</b>	46
<b>VENDOR DIRECTORY</b>	49
<b>CREDITS &amp; LIST OF INTERVIEWS</b>	55

# WIDESPREAD OPTIMISM FOR 2025 TO END ON A GOOD NOTE WITH SOME CAUTION FOR GEOPOLITICAL ISSUES POTENTIALLY IMPACTING RESULTS

## MARKET SENTIMENT (INTERVIEWS)



Source: STIQ Ltd Research & Analysis. Interviews

### 2024 PERFORMANCE

- Multiple interviewees suggest 2024 was a very positive year for revenue growth

“Growth last year was above our forecast.” [NoMagic]

“We were really happy with our performance in 2024.” [ShipHero]

“2024 saw us starting on the rise, its steady slow growth.” [Matthews]

“Sales revenue grew in 2024.” [Pickitoo]

### OVERALL POSITIVE VIEW ON 2025

- Note interviews for this report were conducted during summer of 2025
- Interviews suggest a positive outlook for 2025, with strong expectations for continued growth

“The growth in 2024 exceeded expectations, and we think we’re going to do the same this year...2025 is the year of acceleration.” [NoMagic]

“2025 is continuing from the growth of 2024, we seem to be seeing steady growth.” [Matthews]

“This year... 2025, is quite positive.” [Find & Order]

“We had really good trade shows in 2025 with good leads.” [AWL]

- Suggestions that the influence of COVID is still relevant for growth

“The logistics industry is still benefiting from COVID effects.” [Robominds]

### 2026 RESULTS

- The growth achieved in 2025 is expected to carry over, contributing to revenue in 2026

“We’re very excited for next year because we’re building pipeline. The opportunities take 18 months. Sales revenue will come in 2026...especially with the new Warehouse 360. Conversations are really, really good and very solid.” [ProGlove]

- Startups typically have a positive outlook

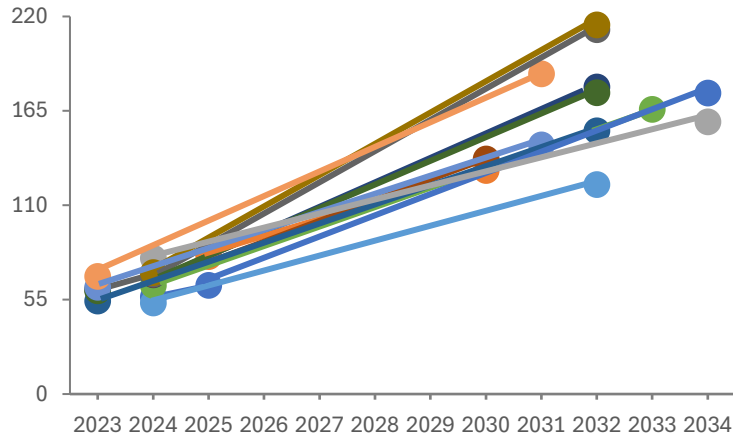
“We pushed into the market this year...we can see there being strong growth as we are talking with several potential customers.” [Arlog]

“We see quite a lot of requests in the market and really have to prioritize what we work on. So that’s interesting and good for us. Of course, it’s good to have a lot of customer demand in the funnel.” [AWL]



# MARKET FORECASTS REMAIN HEALTHY ACROSS PICKING TECHNOLOGIES

**GLOBAL AIDC MARKET,  
2023-2034 (\$BN)**

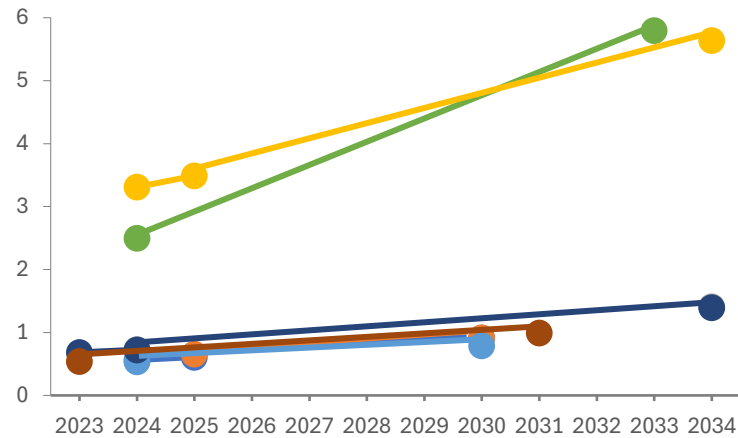


Source: STIQ Ltd Research & Analysis. EMR Expert Market Research. Mordor Intelligence. Precedence Research. Market Reports World. Credence Research. imarc. Business Research Insights. GVR Grand View Research. SkyQuest. MMR Maximize Market Research. GMI Global Market Insights. S&S Insider. KBV. PR Newswire.

## GLOBAL AIDC MARKET, AVERAGE 11.9% CAGR

- According to multiple analyst reports, the global AIDC market increased by 11.9% CAGR in 2023-2034 (on average)
- Projections are higher in market reports due to the inclusion of retail applications, though the overall growth trajectory remains
- Note that market definitions may vary between analyst reports

**GLOBAL PICK-TO-LIGHT MARKET,  
2023-2034 (\$BN)**

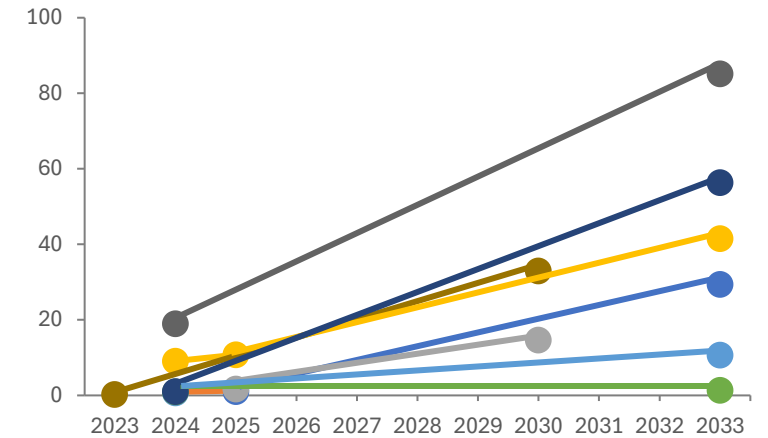


Source: STIQ Ltd Research & Analysis. 360iResearch. Knowledge Sourcing Intelligence. Statifacts. Market Research Future. Research And Markets. Verified Market Reports. FMI Future Market Insight. Data Bridge Market Research.

## GLOBAL PTL MARKET, AVERAGE 7.4% CAGR

- Market research on the global pick-to-light segment estimates growth of 7.4% CAGR from 2023-2034 (on average)
- Two reports stand out as outliers with significantly higher growth rates, highlighting differing assumptions across studies
- Note that estimates vary in methodology, contributing to a wide range of outcomes

**GLOBAL PIECE ROBOTIC PICKING MARKET,  
2023-2033 (\$BN)**



Source: STIQ Ltd Research & Analysis. Data Insights Market. Proficient Market Insights. Mordor Intelligence. Global Growth Insights. Business Research Insights. Market Reports World. imarc. Straits Research.

## GLOBAL PIECE ROBOTIC PICKING MARKET, AVERAGE 33.5% CAGR

- Analyst forecasts for global piece robotic picking market research indicate a CAGR of 33.5% between 2023-2033 (on average)
- Note that projections vary widely, reflecting different assumptions on adoption rates and market maturity



# MANUAL PICKER HEALTH & SAFETY CONCERNS ARE GROWING IN IMPORTANCE AS A MARKET DRIVER

## PICKING TECHNOLOGY MARKET DRIVERS

Topic	Description	Impact	Likely Runway
<b>Efficiency, Accuracy</b>	<ul style="list-style-type: none"> <li>Improved picking efficiency and accuracy are table stakes with technologies, such as AIDC and PTL relatively basic requirements</li> <li>Relatively short replacement cycles continue to drive demand, especially in AIDC</li> </ul>	▲	●
<b>Health &amp; Safety Concerns</b>	<ul style="list-style-type: none"> <li>H&amp;S is a market driver in countries with stronger H&amp;S regulations</li> </ul>	▲	●
<b>New Technologies</b>	<ul style="list-style-type: none"> <li>Software Directed Labor and other picking assistance software tools are relatively new and appear to experience good market traction</li> <li>Other new technologies, such as picking robotics may also improve reliability and capacity availability</li> </ul>	▲	●
<b>Geopolitics</b>	<ul style="list-style-type: none"> <li>Tariffs have disrupted some of the deal flow in the sector with postponed projects, etc. potentially pushing revenue into 2026</li> <li>While there are early signs that customers are accepting tariffs, a level of uncertainty remains about further changes</li> </ul>	▼	◐

Key: ● Long Term ◐ Medium Term ◑ Short Term ◒ Temporary

## THE HEALTH & SAFETY ANGLE

- Health & Safety is a growing concern for companies with such budgets increasingly used to procure improved picking technologies
- “A very large customer paid for our products out of the H&S budget, not from any productivity initiative. Our wearable reduces repetitive strain injuries. But the real success with this customer came through the customer returns side of things.” [ProGlove]**
- Some technologies narrow the scope of movements for human labor, which can potentially lead to repetitive strain injuries increasing the demand for ergonomic designs
- “Pickers are doing exactly the same thing over and over again. They're presented with a box and then they need to very quickly do what they need to do... issues around repetitive injuries becomes greater because you are narrowing the scope of work. If you are pushing more and more aggressively on cycle times it means you are also exposing pickers to greater risk. That is why it is important when you design these stations, you start thinking from the outset around potential for injuries to mitigate as far as reasonably practical.” [DCA Design]**
- Examining human-robot collaborative systems and re-routing robots can be a potential solution
- “Even if the operator was lightning fast, the bottleneck was the robot speed, coming into the system, navigating through the pick station itself, and then back out into the main storage structure. By changing the complete layout and having, in effect, two pick-ports, we then removed the bottleneck of the robot.” [DCA Design]**

Source: STIQ Research & Analysis



# TARIFFS HAVE INFUSED A LEVEL OF UNCERTAINTY AFFECTING DECISION MAKING. SOME OPTIMISM ABOUT THE LONGEVITY OF THE IMPACT

## TARIFFS POTENTIALLY IMPACTING MARKET GROWTH (ILLUSTRATIVE)



Source: STIQ Ltd Research & Analysis

## OPTIMISM FOR 2025, DESPITE TARIFFS

- The sentiment for 2025 remains largely optimistic but is pending any further geopolitical disruption

**“If nothing catastrophic happens, which is always possible these days, I would say 2025 will be quite okay.”**

**[Anonymous]**

**“I'm optimistic for 2025, but the results depend on the country situation.” [Anonymous]**

## TARIFFS CONTINUE TO BE A CONCERN

- The speed of changes to tariffs is a concern and is likely to have impacted some of the decision making

**“The speed of the change in tariffs definitely hurt. People are afraid to make a commitment. There's a lot of unknowns which is not good for business. We definitely see people just not wanting to make decisions. But hopefully it's at least stabilised at this point. So the impact will be less, but there's still definitely unknowns.” [Anonymous]**

- The primary impact from US tariffs is a heightened level of uncertainty

**“Obviously, tariffs are a concern because they can be a barrier to sales.” [Anonymous]**

**“Customers are nervous because their outbound product, they don't really know what the cost structures are going to be or what they're hit on margins or other aspects.” [Anonymous]**

- Customers appear to be more careful in decision making and have slowed down or postponed processes

**“We're definitely seeing it's hard to sell compared to the last year. I don't know how much, I think it's definitely a lot due to the uncertainty of the tariffs.” [Anonymous]**

**“My impression of the logistics industry is that people are getting a lot more careful about investments. There's a lot more uncertainty. I would say we can see a lot more attention being paid to costs and sometime maybe less energy on the payback. But we also see some investment in R&D being deferred because we have to be integrated and are dependent on our customers to get into their product.” [Anonymous]**

- There is a belief some of the impacts will be short term

**“We have seen a reduction in trading volumes across our customer base. They all believe it is short term. They're sort of hedging their bets. They've slowed up and want to see how this all shakes out with tariffs and so on. But, yeah, we're seeing less volume.” [Anonymous]**

## US OFFICES MAY BE AN ADVANTAGE

- Some companies with US offices may also be able to execute projects within the US and avoid some of the import tariffs on projects by buying hardware locally

**“The biggest impact of tariffs is on projects routed from Europe to the US where we need to calculate the tariff and we have to bring that to the customer. But we can also execute projects in the US market with no tariffs.” [AWL]**

- However, STIQs view is any such advantages may even out in the medium to long term
- The main advantage may be lessening competition from Asian vendors

**“We see a lot of Chinese competition in the automotive sector. Less in intralogistics.” [Anonymous]**



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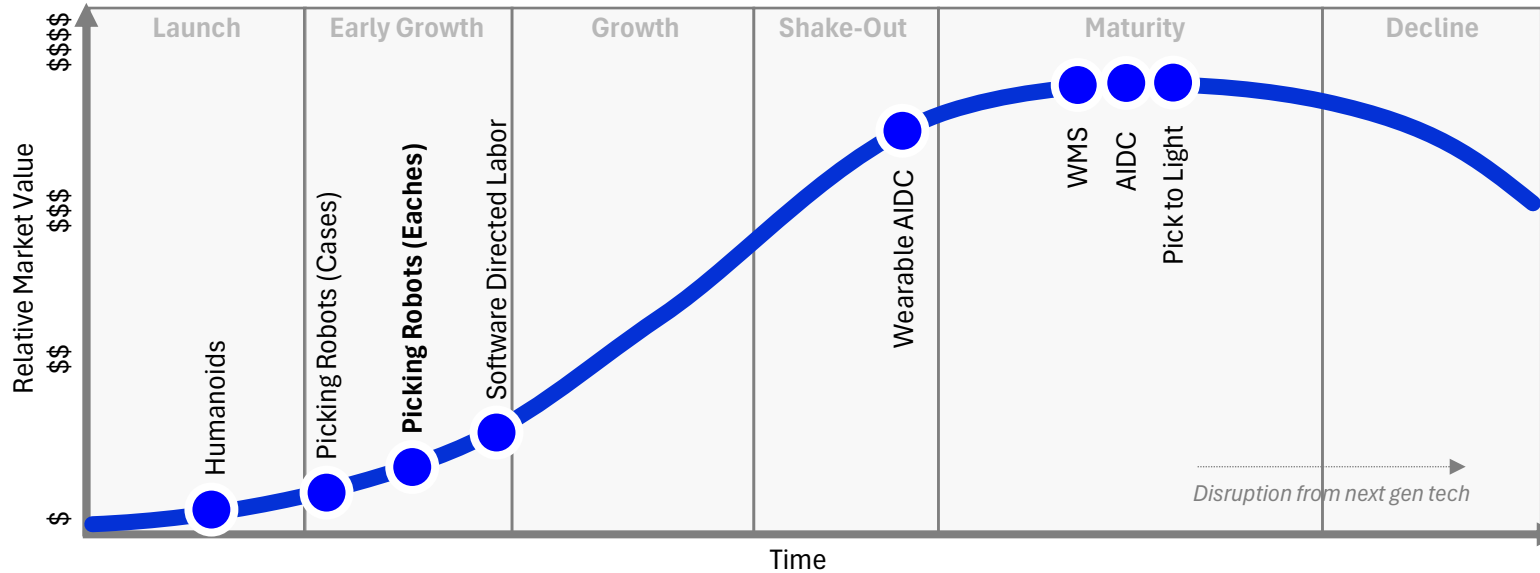


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<b>CONTENTS</b>	<b>PAGE</b>
<b>EXECUTIVE SUMMARY</b>	2
<b>MARKET INTRODUCTION &amp; SEGMENTATION</b>	3
<b>CASES VS EACHES PICKING</b>	10
<b>MARKET GROWTH</b>	15
<b>PICKING TECHNOLOGIES</b>	20
<b>MANUAL+ (AIDC, PTL, SOFTWARE, ETC.)</b>	22
<b>ROBOT PICKING (EACHES)</b>	31
<b>ROBOT PICKING (CASES)</b>	39
<b>HUMANOID PICKING</b>	43
<b>SECTOR DEMOGRAPHICS</b>	46
<b>VENDOR DIRECTORY</b>	49
<b>CREDITS &amp; LIST OF INTERVIEWS</b>	55

# PICKING AUTOMATION MARKET MATURITY

## MARKET & TECHNOLOGY MATURITY SCALE – PICKING AUTOMATION PRODUCTS & SOLUTIONS



Source: STIQ Ltd Research & Analysis

## PICKING TECH LIFECYCLES

- Mature technologies used in picking include Pick To Light, AIDC and WMS
- All these technologies are considered mature and continue to evolve slowly, often with incremental innovations
- Wearable AIDC is nearing maturity but is currently at a stage where there is a relatively higher level of innovations, such as using devices with localization technologies to enable route pattern analysis, simulation or digital twins, and potentially more software directed picking algorithms
- Software Directed Labor is maturing fast and may also be used in combination with mobile robotic fulfillment solutions
- Robotic picking technologies remain at a relatively early stage, although each picking has experienced growing post-Covid traction
- Humanoids are at launch stage largely with POC and trials to determine use, efficiencies, etc.

## TECHNOLOGY LIFE CYCLE

- In the automation sector, the rise and maturity of technologies shapes market evolution and influences adoption decisions
- The graph highlights the relative maturity and value contribution of key picking technologies
- Even at maturity, technologies continue to adapt and extend their functionality for example, AIDC systems evolving into wearable formats
- Similarly, the integration of AI-driven elements into established technologies offers more adaptive picking processes
- The sector anticipates transitions in warehouse operations, with next-generation technologies such as humanoid robots, drones, and AI-driven automation



# AIDC HANDHELD & WEARABLES: MATURE MARKET WITH MAJORITY REPLACEMENTS AND INCREMENTAL DEVELOPMENTS. ROUTE TO MARKET VIA PARTNERSHIPS

## MAJORITY REPLACEMENTS

- The AIDC solutions market is largely a replacement market

**“I would say in min. 90% of Cases we're replacing something else, typically some legacy AIDC offering, rather than pen + paper.” [ProGlove]**

- The replacement velocity for AIDC devices appears to be generally quite high

**“Typically customers will plan replacements every 3-4 years for mobile devices... they get rocked up pretty fast.” [ProGlove]**

## AIDC LOST IN ACTION

- Handheld devices are frequently misplaced or accidentally removed from designated areas

**“It's not uncommon that handhelds disappear. One of our customers lost up to 30% of their mobile devices within 6 months... employees taking them with them or the device somehow getting lost in parcels and so on. On the other hand we also have customers reporting losses of less than 3% per month.” [ProGlove]**

- A key prevention feature of ProGlove helps reduce missing devices
- If the device leaves the customisable mapped area, the device itself sounds an alert, helping prevent accidental removal or misplacement by the worker

**“We created a lost & found edition with Bluetooth gateways. If the device goes out of range it immediately makes a loud noise. Now we're also using the gateways for gates and exit doors to make sure that whenever a device passes through those, the device alarm goes off. That has helped a lot of our customers to reduce shrinkage.” [ProGlove]**

## MARKET DRIVER FOR EASIER & BETTER AIDCs

- High employee turnover in warehouses creates substantial costs and time requirements for onboarding and training
- Simplified training is therefore a key consideration in technology adoption
- AIDC solutions reduce training time, allowing new employees to become operational more quickly

**“Sometimes we see things like onboarding time. Employee turnover tends to be pretty high, especially in warehousing and distribution... so continuously getting new people to work with tools and equipment. I mean does it take a couple of hours to get up to speed or is there a significant learning curve ... say pick-by-voice, there's a big learning curve, complicated MDEs, etc. Our little device with a thumb trigger, is pretty simple and we see people get up to speed really fast, so that's what customers look into when buying new AIDCs.” [ProGlove]**

## SALES CHANNELS, PARTNERSHIPS

- Direct sales are increasingly important for startup, but in the AIDC market indirect sales remain equally vital

**“ProGlove, being a bit startup, we started out thinking we can conquer the world with direct sales. But obviously we've realised the indirect sale or all these various intermediaries are very important in the AIDC market.” [ProGlove]**

- Partnerships with robotics vendors expand sales opportunities and support integrated solutions

**“Our partnership with Locus Robotics is pretty significant numbers. A number of their bots are shipped with a ProGlove especially for the storing process.” [ProGlove]**

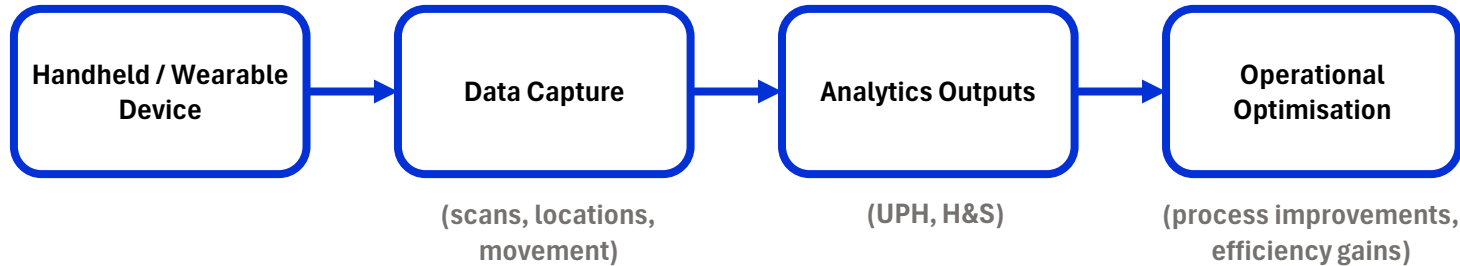
- Flexibility to switch between human workers and robots within AIDC software drives partnership decisions due to the speed of switchover

**“Locus was relatively open to working with either one of the AIDC players. I think we were simply much more flexible on doing a couple of tweaks on the software. We designed an interaction mode for the bots and the scanner. The challenge is that you will continuously have new people connecting to a Locus bot. You need to get that connection really efficient and once you're done with your job, it needs to lose that connection, or at least the scanner needs to be open to connect to the next bot. We were super flexible in getting that up and running relatively fast.” [ProGlove]**



# AIDC HANDHELD & WEARABLES: DEVICE ANALYTICS BECOMES A CORE PART OF THE SALE

## ANALYTICS EXTEND THE VALUE OF AIDC SOLUTIONS



Source: STIQ Ltd Research & Analysis

## ANALYTICS ALSO PART OF THE SALE

- Integrated analytics as part of POC allow customers to compare current installations with alternative systems
- Data insights identify key performance metrics such as UPH and highlight important considerations such as H&S

**“When we do a POC with our customers we always push for having a good A/B analysis of current installation vs. ours. Then UPH measure is what they're looking for. As I said, the H&S aspect also comes into it more often. We encourage customers to really understand whether there's an improvement... obviously price is a significant consideration.” [ProGlove]**

## GROWING DEMAND FOR ANALYTICS

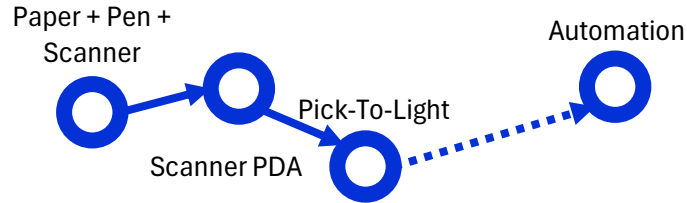
- Demand for analytics grows as customers seek insights to maximize the effectiveness of AIDC technologies
- ProGlove's solution, enabling customers to transform operational data into actionable insights for process improvement and warehouse optimisation

**“We have transitioned into more analytical projects because customers asked us - hey, you have all scanning data, locations, movement data... why not use this for process mining type applications? We did that manually for a while. In 1Q25 we started offering ‘Warehouse 360’. Customers can use this to understand if there's too much waste from walking, congestion or understanding optimization potential for storage locations.” [ProGlove]**



# PICK-TO-LIGHT IS OFTEN THE FIRST ENCOUNTER WITH ‘LIGHT AUTOMATION’ (MANUAL+) FOR MANY WAREHOUSE OPERATORS

## SAMPLE PICKING DEVELOPMENT (SIMPLIFIED)



Source: STIQ Ltd Research & Analysis

## TYPICAL PICKING TOOLS DEVELOPMENT

- Interviews suggest the average company may move from paper + scanner to scanner PDA and then on to pick to light and more akin to automation

**“A normal automation process goes from paper + scanner to scanner PDA and then to pick-to-light. It’s the next step... the first automation part they can touch.” [Pick To Light Systems]**

## PICK-TO-LIGHT EFFICIENCY IMPROVEMENTS

- There are two primary benefits with deploying PTL, efficiency improvements and accuracy
- The level of improvements vary depending on the SKUs picked, how they are packed, etc.

**“We are pretty confident that on average, somebody who goes from manual paper-based system to pick-to-light would experience a c.40% increase in pick rate productivity. They’re also going to get a 99.9%+ order accuracy. Depending on the different applications of lights we can do, there would be c.40-50% decrease in labor costs.” [Matthews]**

**“The minimum efficiency improvements customers can expect from PTL is 15%. But we also have customers who experienced a 60-70% uplift. It depends on many variables, the market sector, how they worked before, etc.” [Pick To Light Systems]**

- Newer integrators are considering alternative business models for PTL

**“A human may pick 100 units per hour, some places they do better and others do less. If I can get that up to 200 picks... what I want to do is come and fit the lights, put all the light modules in, give them the software and say ‘every time you press that button I’ve saved you 12 seconds. I’ll take half of the saving in return for the PTL installation and you don’t pay for anything.’ That’s our as-a-service offering.” [Guidance Automation]**

## MARKET DRIVERS FOR PICK-TO-LIGHT

- The primary driver for pick to light technology is efficiency and accuracy improvements

## PICK-TO-LIGHT TECHNOLOGY



Image source: Matthews, Lightning Pick

**“At ShipHero we believe that efficiency is key. Customers want to get more from staff and push out more product. We focus on that: maximizing people’s output and increasing warehouse performance.” [ShipHero]**

- Eliminating or reducing costly picking mistakes is also a key driver for pick to light technology

**“Sometimes the added value with a PTL solution is just to not make mistakes. For example, when picking wine bottles it is rarely about speed of picking, but rather accuracy. It is often similar for other high value items.” [Pick To Light Systems]**



# PICK TO LIGHT/ LIGHT DIRECTED PICKING: TWO PRIMARY CUSTOMER INDUSTRIES IN DISTRIBUTION AND MANUFACTURING

## END CUSTOMER INDUSTRIES

- Distribution/ warehouses and manufacturing industries account for a vast majority of sales with distribution customers buying more than manufacturing

**“Our sales split into 60% distribution, 40% manufacturing.” [Pick To Light Systems]**

- Ecommerce fulfillment presents plenty of opportunities for pick to light deployments

**“We introduced smart tools like receive to light, pick to light, and pack to light. We have direct pack stations in which the product is right there, and lights guide the operation. Our packing stations are keyboard or mouse-free, everything is automated and guided by lights.” [Shiphero]**

- The ecommerce sector also tends to deploy larger systems

**“Other companies focus PTL on the e-commerce side of the business. Normally very large systems for very big companies. We’re trying to do a much simpler piece... we don’t have the software for e-commerce because my focus is on the manufacturing sector.” [Guidance Automation]**

- Some vendors target non-ecommerce applications in industry for line side applications

**“PTL for ecom is about batching the orders together, working out the flow rate around the place and the rooms, etc. That becomes more complicated. The piece that I’m trying to do is build-to-light, where you’ve got the line side items, nuts and bolts and things for kitting type applications.” [Guidance Automation]**

## SALES CHANNELS & SYSTEM INTEGRATORS

- System Integrators are an important sales channel for some vendors, but may vary depending on the business model and larger projects in any particular year

**“The vast majority of our customers are System Integrators. Customers normally prefer a turnkey solution and we do not sell the integration part... only the system software.” [Pick To Light Systems]**

**“Around 50% of our sales go to system integrators. The mayor ones have interfaces to our software, so we just supply the hardware and our device manager software. For direct customers, we also integrate with their WMS or ERP systems.” [KBS]**

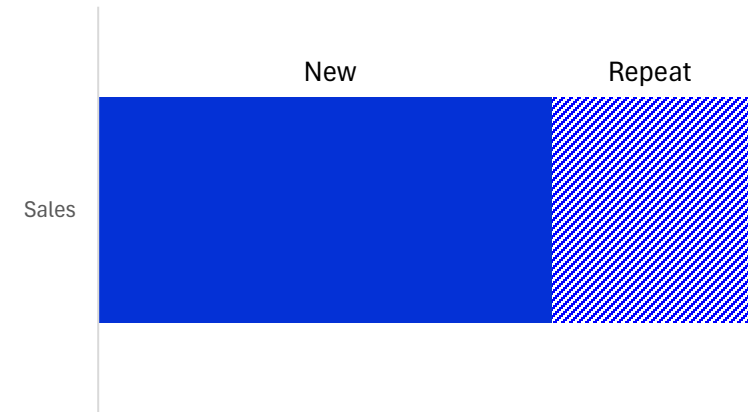
- The system integrator channel appears to have been growing in importance in the last decade

**“Sales to system integrators increased. Previously about 70% went directly to customers. Over the last 10–15 years this shifted to roughly 40–60%.” [KBS]**

- Most vendors also sell directly to larger end customers

**“Our primary customers fall into two categories, system integrators and end users. 3PLs make up a good part of our business and we see more coming. Integrators will come up with a project that has many components and part of what they need is light-directed order fulfilment. So, we might integrate a picking system as part of a larger project that way as well. Some years you’ll have more integrator business and others more direct. COVID ran up integration projects a little bit. Now it’s returning to a more of an even split. [Matthews]**

## REPEAT CUSTOMERS, AN IMPORTANT FACTOR



Source: STIQ Ltd Research & Analysis

## IMPORTANCE OF REPEAT CUSTOMERS

- Repeat customers may represent a significant proportion of sales as buying from the same vendor can have technical advantages to easily integrate with existing systems and retain functionality

**“Repeat customers make up about 20–30% of our revenue. Many return to us, and some have been with us for decades - even 30 years.” [KBS]**



# SOFTWARE INTEGRATION CAN BE A BARRIER TO PTL SOLUTION ADOPTION. NOT ROCKET SCIENCE, BUT TECHNICAL COMPATIBILITY CAN BE A USP

## INTEGRATION CAN BE BARRIER TO ADOPTION

- For any new solution, integrating new software can be a barrier to adoption and some PTL vendors have focused on making this an easier process

**“Integration used to be the biggest point of concern for any customer. Our focus over the years has been to change that pain point into a strength. But you’re right, integration continues to be a major focus for any project. Our base software is designed to make that as painless as possible.” [Matthews]**

- A few PTL vendors also offer software and a variety of software integration services, often depending on the complexity of projects

**“We produce the hardware and, on demand, connect it to customers WMS.” [KBS]**

**“We have a standard interface, which probably is used 50-60% of the time. We’re capable of the minor modifications – often a custom piece of software – that’s needed the other 50-40% of the time to ensure successful integration with anybody’s host system. It depends on the circumstance and there are usually multiple touch points in any system. You might be talking to a WMS, a WES, moving data up to a labor management system, and so on.” [Matthews]**

## COMPETITION IN THE PTL SEGMENT

- While there are competitors, ensuring technical compatibility in the long run may be more important for some customers

**“Anyone can make a PTL system. But it’s not easy to manage over time... technology changes, etc. It is difficult to support customers for long periods. Our retro-compatibility is great value and if you install something now, in 10 yrs it will still be compatible. This is a big difference.” [Pick To Light Systems]**

- Industrial customers may also require a different level of quality and functionality

**“Some Chinese and Japanese vendors handle large volumes of PTL pick faces. But for industrial or more complex projects, other requirements apply, and other providers often win.” [KBS]**

- Some software vendors have begun offering PTL hardware as part of their offering to provide a more compelling solution

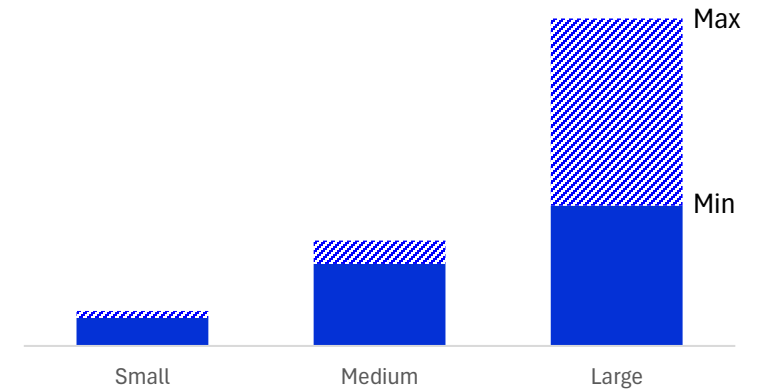
**“We’re adding hardware to be used with our software, but not selling it separately. This makes the product stickier and much better. Customers can gain more efficiency and get more from their people.” [ShipHero]**

## OTHER DEVELOPMENTS, LIGHT POINTERS

- LED pointers (aka ‘laser pointers’) have also entered the market, but represents a small share of light directed solutions

**“We developed a LED pointer system 10 years ago to illuminate different compartments in a tote. Some ASRS vendors asked for this. The goal was to give operators clearer info beyond the screen.” [KBS]**

## PICK TO LIGHT PROJECT SIZES (\$K)



Source: STIQ Ltd Research & Analysis

## MAX (ISH) SIZE OF DEPLOYMENTS

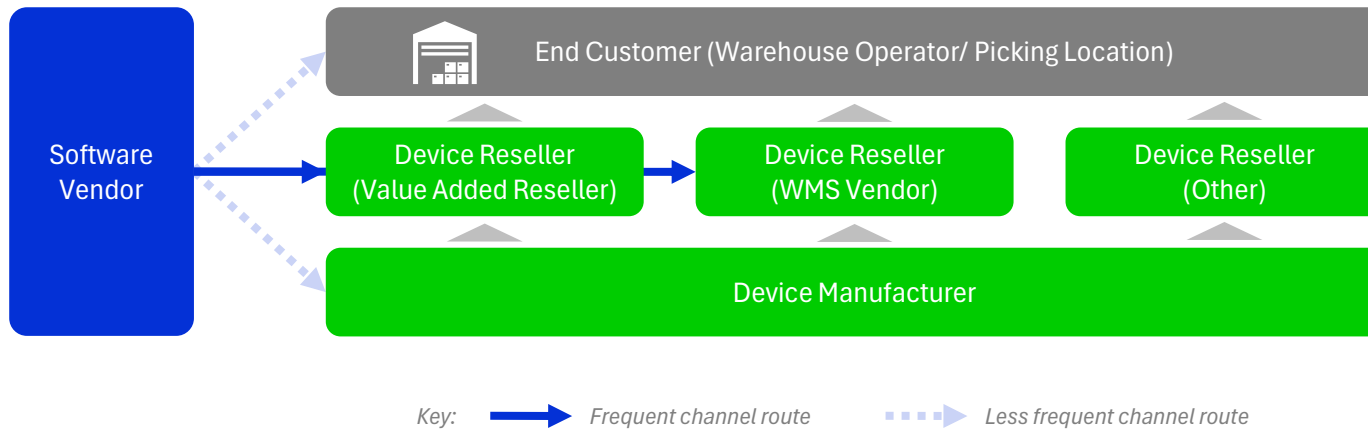
- Interviews suggest there is a natural max for PTL installations at which point other forms of automation may become more feasible

**“Yes, there is an upper limit. If you’ve got 30,000 locations, you’re probably not picking high velocity out of many of them. Once you go above 4-5,000 lights, you’re probably looking at something else. What tends to happen in those cases is you may opt to batch pick orders instead, using different technologies. So, you may apply lights in the form of a put wall or cart, then use RF picking to pick the batches.” [Matthews]**



# SOFTWARE VENDORS PRIMARILY LOAD ON TO AIDC DEVICES, BUT MAY INCLUDE END CUSTOMER DIRECT WITH VARIOUS TOOLS

## VALUE CHAIN FOR MOBILE DEVICE WAREHOUSE SOFTWARE VENDORS (SIMPLIFIED)



Source: STIQ Ltd Research & Analysis

Note: Further information on WMS vendors can be found in STIQs annual [WMS reports](#)

### THE SOFTWARE BUSINESS MODEL

- There are multiple different software packages for picking (including put away, etc.), from voice directed to mapping & routing software and more
- Many of these packages are loaded on to AIDC devices but there are also increasingly sophisticated back ends and other types of functionality

**“We are contracted directly by retailers.” [Pickitoo]**

### VOICE SOLUTIONS BUSINESS MODEL

- Voice picking often requires a separate compute module to operate on, but some higher end AIDC devices may have enough memory capacity to manage language recognition processing
- Voice picking vendors may offer own hardware (body worn devices) or sell software only to various customers

**“We operate a B2B2B business model. We don’t sell to warehouses directly but to companies that will build the equipment that will go into the warehouse.” [Vivoka]**

- Some vendors process language in the cloud while others offer on device processing

**“Our technology is embedded. We run completely on the device which has many advantages including cost. Almost all cloud solutions charge a usage fee per minute of speech. If you run something on the device - once you’ve paid for the device, it’s completely free to use.” [Vivoka]**

### FEW SELL DIRECTLY TO IT DEPARTMENTS

- IT departments tend to have many different and competing priorities and a full pipeline of work, and may offer a less fruitful sales entry point

**“We never sell into IT department, only operations. The people in charge of operations in warehouses, are in charge of efficiency. So you talk to operations, you talk to method and process. This guy will assess the solution quite quickly and come to a decision.” [Find & Order]**

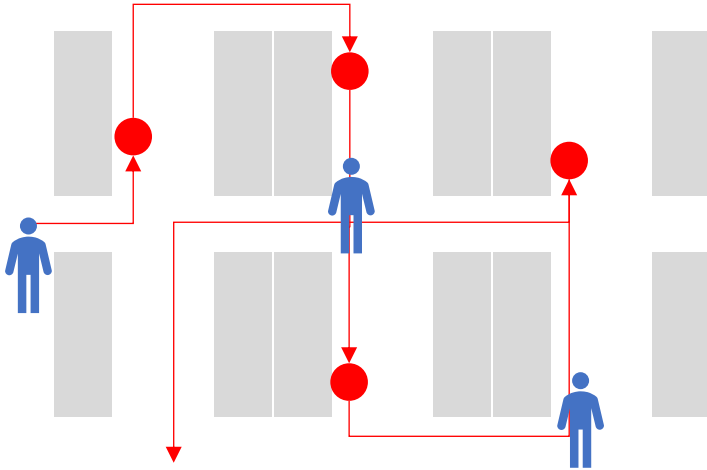
- Some vendors have focused on making integration as simple as possible to minimize any internal customer IT work

**“The platform is designed to support simple and easy integrations, because we understand that for huge retailers their systems are massive, monolithic and difficult to modify.” [Pickitoo]**



# SOFTWARE PICKING – ROUTING: EFFICIENCY UPLIFT AT 25-35% FROM SOFTWARE DIRECTED PICKING, OVERLAP WITH AUTOMATION TECHNOLOGIES, SUCH AS P2G

## SOFTWARE DIRECTED PICKING (ILLUSTRATIVE)



Source: STIQ Ltd Research & Analysis

## EFFICIENCY IMPROVEMENTS

- Interviews suggest software directed picking can achieve up to 25-35% efficiency improvements

**“We increase picking efficiency in warehouses by 25%. This is a software that sits on top of the WMS. The KPI we sell is very easy to understand. Warehouses track these kind of indicators all day long. For one of our grocery customers that’s what we get. For smaller ecom players, it can be between 12-20%. It depends on size, it depends on the number of operators, the way they work, etc.” [Find & Order]**

- Vendors indicate there is a large opportunity in the market

**“Software directed labor is here to stay for the foreseeable future. There’s such a huge opportunity,” [Ox]**

## OVERLAP WITH OTHER AUTOMATION

- There is a level of overlap with other automation technologies such as ASRS systems, etc. and each customer has to calculate the efficiency uplift vs the money required for the uplift

**“A common question is, ‘if I’m going to invest in improving the productivity of the workers, why not go all the way and just automate the worker away?’ This is essentially an economic equation. If you add voice to a typical picking task, you’re going to see improvements of up to 35% in productivity.” [Vivoka]**

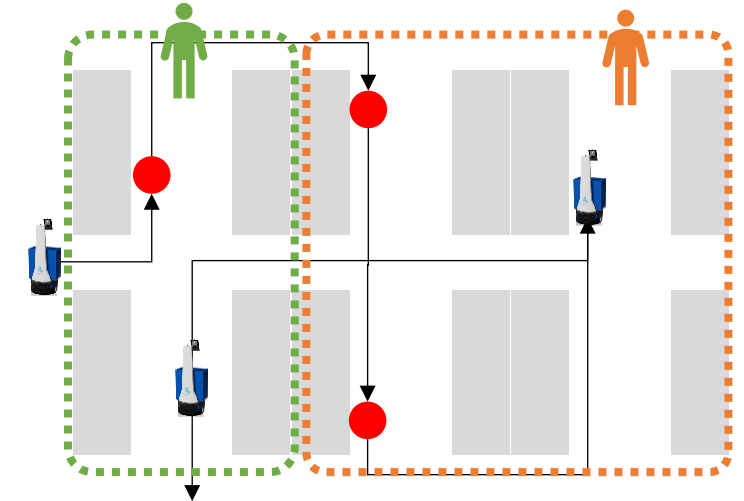
- Some software directed solutions overlap with zone picking strategies and the use of P2G Robotics, covered in STIQs [Goods to Person Solutions](#) reports covering ASRS systems in depth

## MAP BUILDING FOR ROUTING

- Vendors build a digital model of the warehouse layout and use that map to direct labor in the most efficient way

**“We take a CAD file and we’ve built some software internally that utilizes AI to be able to take a CAD file and very quickly convert this into a format that allows us to understand at a very good level of detail the geometry in the warehouse and perform a bunch of simulations.” [Ox]**

## ZONE PICKING WITH P2G ROBOTS (ILLUSTRATIVE)



- **Zone Picking** is a picking strategy where a person is assigned an area (green or orange) and pick only in that area or aisle
- This can be manual or automated using P2G-type robots which traverse picking zones and may also be combined with a batch picking strategy
- **Batch Picking** is a picking strategy where multiple orders are picked into the same container to be separated just before packing area

Source: STIQ Ltd Research & Analysis

## WAREHOUSE CUSTOMERS

- Many 3PL customers are typically very adept at optimizing warehouse operations and seem reluctant to invest in software directed solutions

**“3PL is a slow sector for software and they are also less risk averse.” [Anonymous]**



# SOFTWARE PICKING – ROUTING: IN-STORE RETAIL PICKING FOR ONLINE ORDERS APPEARS AN APPLICATION WITH TRACTION CURRENTLY

## POPULARITY OF IN-STORE PICKING

- Interviews suggest relatively strong (post-Covid) traction for in-store picking with grocers currently focusing on this as a primary fulfillment process (read also STIQs [Online Grocery Automation](#) report)

**“We have two kinds of clients. The most important are large retailers, grocers, sports, home equipment, whatever. Any large retailer with a large network of stores that need to deliver goods... over 50 stores at least. The second customer is 3PLs. But what we’re seeing is that 3PLs are testing a lot.”** [Find & Order]

- Online grocery also overlaps with Quick Commerce (aka Q-Com) fulfillment which is changing from ultra fast to just fast processing of orders

**“We have multiple modules in our product. One of them consolidates Q-com delivery companies. Now you don't need to have multiple devices in the store to service all of these sales channels. We also optimise the back-office operations with a single dashboard to manage all the multiple different delivery providers... your own gig network, JustEat Drive, Uber Direct and so on. The platform is modular, but when you take the whole platform, it allows a retailer to go online really quickly.”** [Pickitoo]

- Customers may also have larger dedicated fulfillment centres but implement software directed picking in-store environments

**“The majority of our customers already have an online presence. One of our customers has a large e-commerce fulfilment centre, but they use our solution to do picking in stores. We connect them to a food delivery company through our application.”** [Pickitoo]

- There can also be important efficiency improvements from using wearable devices

**“We have 1,000’s of devices with a grocer for in-store picking, mostly for out-of-store deliveries. They’re quite happy with that solution that. We haven’t made any measurements, but the customer tells us they’re around 10% more efficient with the wearable in that application.”** [ProGlove]

## Q-COMMERCE ORDERS PARTICULAR

- Q-com orders tend to require single order fulfillment due to delivery and/or picking SLAs

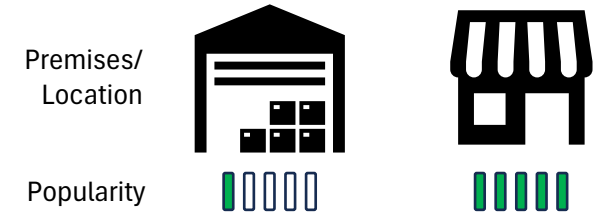
**“We have order consolidation functionality, but the way we'd like to discuss with the retailers or what we like to say is that in quick commerce, you need to be fast on single orders.”** [Pickitoo]

## CATEGORY LEVEL INDICATION

- Stores are very dynamic environments mixing consumers with staff, and products may be misplaced, etc. when topping up

**“In warehouses, everything is super organized. They have a culture of efficiency, innovation, of process, of testing stuff, and people are on the same page. In store, it’s often less organised because its changing rapidly.”** [Find & Order]

## SOFTWARE DIRECTED PICKING – POPULARITY FOR IN-STORE PICKING ASSISTANCE (ILLUSTRATED)



Source: STIQ Ltd Research & Analysis

- This can make it difficult to pinpoint exact location of a product with most solutions pointing to a category area rather than a specific pick location

**“We use category-based picking paths at store level. For each store we can provide what should be the correct category path. The reason is because grocers pick with their own employees, they don’t need to use delivery drivers for this. Because these are the same people who would decant and replenish shelves, they often know where items are so we don’t have to provide the item level.”** [Pickitoo]



# SOFTWARE PICKING – VOICE: OPTION FOR HANDS FREE OPERATIONS CAN BE USEFUL IN CERTAIN CIRCUMSTANCES

## ALLOWING FOR HANDS FREE OPERATIONS

- Voice picking is a specialist voice recognition technology allowing warehouse pickers to operate hands free potentially carrying heavier items or manipulate objects

**“We specialise in voice AI... voice agents or assistants... with the ability to understand what people say and to reply. We don't try to be Siri or Alexa. Right now, we focus on 3 industries. One is logistics, mainly people operating in warehouses where they need to operate hands-free and where being able to interact by voice is a plus. The 2nd is field services and the 3rd is the healthcare industry.”**

**[Vivoka]**

- Voice picking applications are not Siri or Alexa and there may be a level of localization/contextualization required depending on the type of goods managed, shipping destinations, accents in the warehouse, etc.

**“Logistics applications are relatively easy for voice picking. Often you can manage with simple commands, numbers and letters. But here you may require some adaptation. A lot of users will have accents. Take the example of entering UK postal codes - which contain a mix of digits and letters. If you try to do that with somebody with a strong accent and the system knows about all the valid post codes, you can use that and correct in our model. If someone says C47-D37 and the system recognises Z47-D4037. Our system would say wait, there is no Z47 code, that must be a mistake.”**

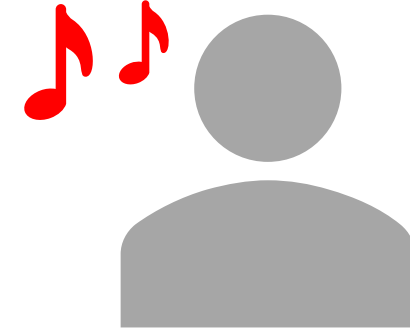
**[Vivoka]**

## WHOLESALE PICKING & RETURNS POPULAR

- Order fulfillment or picking from pallets is a popular application, but also increasingly in ecommerce returns situations

**“There are multiple situations for voice. It could be picking from pallets. A very common voice picking application is pickers that go through aisles with a cart and get directions by voice... But we also have use Cases in e-com returns. When you have to validate the return package, and confirm what's inside. You open the package, look at what's inside, and report: ‘OK, looks in perfect condition,’ or ‘package is open, looks damaged.’”** [Vivoka]

## SOFTWARE DIRECTED PICKING – VOICE



*Source: STIQ Ltd Research & Analysis*



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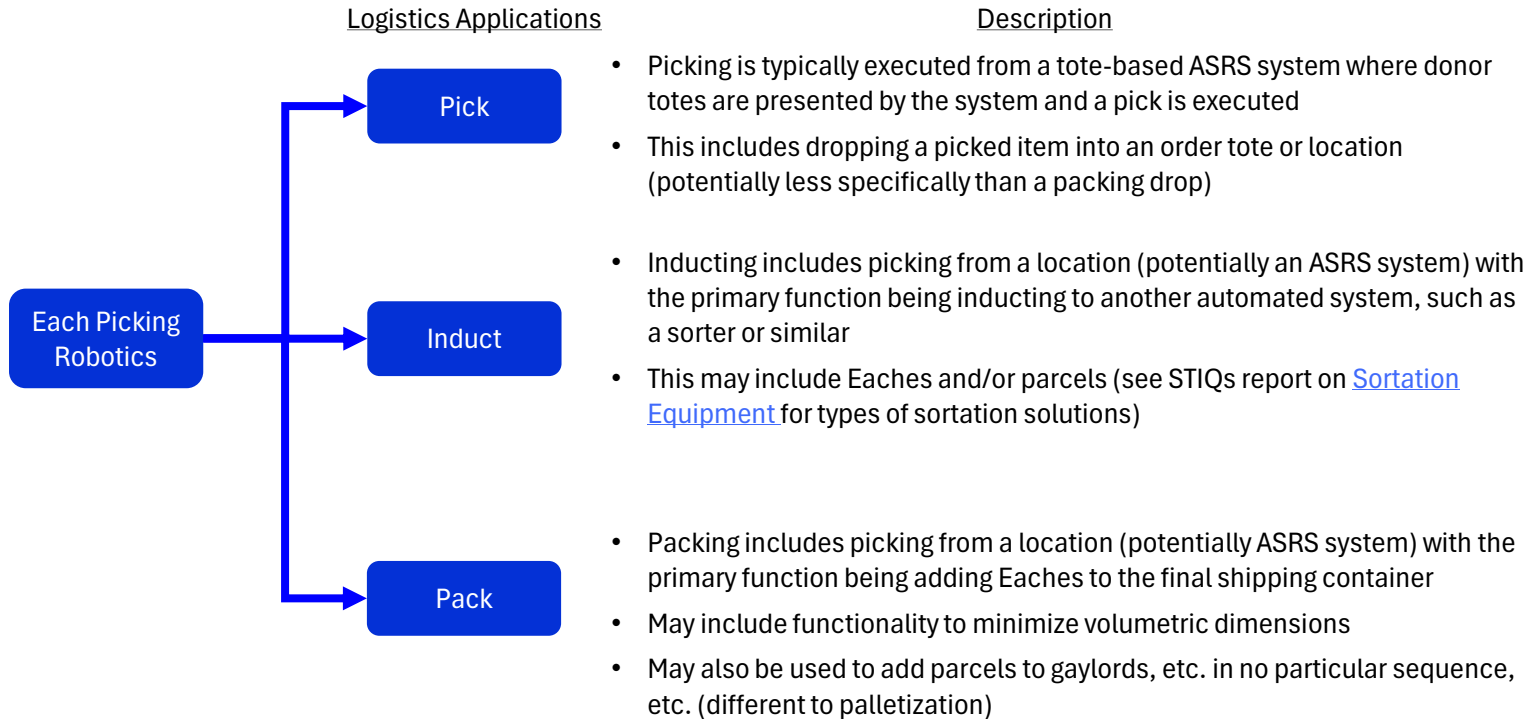


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<b>CONTENTS</b>	<b>PAGE</b>
<b>EXECUTIVE SUMMARY</b>	2
<b>MARKET INTRODUCTION &amp; SEGMENTATION</b>	3
<b>CASES VS EACHES PICKING</b>	10
<b>MARKET GROWTH</b>	15
<b>PICKING TECHNOLOGIES</b>	20
<b>MANUAL+ (AIDC, PTL, SOFTWARE, ETC.)</b>	22
<b>ROBOT PICKING (EACHES)</b>	31
<b>ROBOT PICKING (CASES)</b>	39
<b>HUMANOID PICKING</b>	43
<b>SECTOR DEMOGRAPHICS</b>	46
<b>VENDOR DIRECTORY</b>	49
<b>CREDITS &amp; LIST OF INTERVIEWS</b>	55

# EACH PICKING ROBOTS: APPLICATIONS IN LOGISTICS AND WAREHOUSE ENVIRONMENTS INCLUDE PICK, INDUCT AND PACK

## THE PRIMARY APPLICATIONS FOR PICKING ROBOTS



Source: STIQ Ltd Research & Analysis

## KEY ROBOT AREAS - PICK, PACK AND INDUCT

- Interviews suggest most robot picking vendors target 3 primary logistics / warehouse applications – pick, induct and pack

**“We do 3 things... order picking, order packing, and induction to sorters. Induction and picking are bigger right now. Packing is still probably a bit less. But that is changing and I think over time the three may have relatively equal weight for us.” [NoMagic]**

- Sortation applications can be part of the robot itself (for example sorting into different cubbies, etc.) or inducting to sortation equipment, such as cross belt sorters, pocket sorters, and beyond

**“Sortation and induction are the usual things which are easier to start with. We think our robots can deliver value there. They can move a little faster and the restrictions are a little easier compared to picking from an ASRS.” [Nexera Robotics]**

**“We've done quite a bit of pocket sorter induction in the fashion space.” [NoMagic]**

## INDUSTRIAL ROBOT INTEGRATORS

- A few industrial robot integrators also integrate with picking robotics vendors but often have a far larger industry scope compared to the piece picking robotics space

**“We do what we call singulation or induction to sortation and item picking. Most inquiries on picking are not piece picking... picking from a tote... we have get different applications, cases, industrial use cases... we need to be flexible in our approach and have partnered with a group of selected piece picking robotics companies with their own strengths.” [AWL]**

- Integrators may also compete (more or less) directly with vendors in some applications and there can be a level of price competition with better funded vendors

**“Piece picking is not the easiest market because there are still many startups out there.” [AWL]**



# EACH PICKING ROBOTS: TECHNOLOGY REACHING MATURITY WITH GROWING CUSTOMER AWARENESS OF CAPABILITIES

## GROWING SEGMENT & TECH MATURITY

- Interviews suggest there is a general sense among vendors the Eaches picking robotics segment has matured

“There’s a general feeling of sector maturity. 4 years ago you saw robots all around at LogiMAT. But if you were asking most suppliers, they were just doing a pilot here and there. This has definitely changed in the past year and a half.” [NoMagic]

“There is now a level of maturity in the picking robotics sector. It’s not just a thing that early adopters are looking at, but rather this is becoming a mainstream technology.” [Covariant]

“The systems are for sure better now than they were 3-4 years ago.” [Nexera Robotics]

- Segment maturity may also be pushing up the size of potential projects in the market

“At the start of the year I saw like a peak, a real increase. I still see that there are some bigger projects in the market.” [AWL]

## GROWTH SECTORS

- Interviews suggest there is no single customer sector where demand is clear although logistics and grocery applications appear to be mentioned slightly more

“We saw early adoption in like healthcare and pharma. Now we have deployments and more interest in verticals including fashion and grocery and home office suppliers.” [Righthand Robotics]

“I don’t have a strong sentiment of one sector versus the other. What I see are the same set of factors driving automation in general. And those are not industry specific.” [Covariant]

“I would say it’s probably 50% in logistics right now. But it varies. So we’re seeing a lot of movement in 3PL right now. But last year was a down year for 3PL.” [Fizyr]

“The logistics industry is still benefiting from COVID effects. They experienced quite a high but it did go down again... but it’s still on the same trajectory if you compare to the pre-Covid trajectory. This is something we benefit from.” [Robominds]

“We have solid traction in grocery retail, where the SKU mix is versatile and challenging. The other sector is spare parts.” [Yango Robotics]

- European companies appear to be further ahead in their Eaches picking automation which could be an effect of there being more ASRS systems deployed

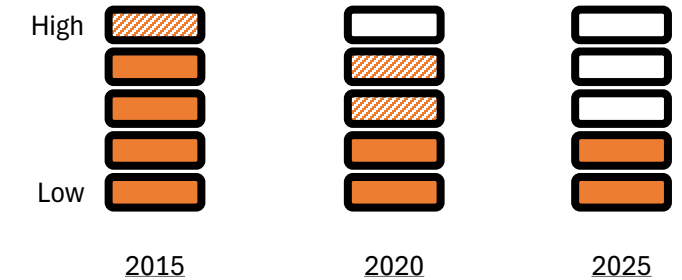
“I think European customers have been the market leaders in adopting picking automation... They’ve had greater urgency given the factors they see.” [Covariant]

## BARRIERS TO ENTRY COMING DOWN

- The market and technology has matured and improved, but barriers to entry have also come down somewhat and it is easier to enter today compared to a few years ago

“Barriers to entry in the piece picking robotics market have come down. It doesn’t cost quite as much to develop the system... You don’t need to raise \$250m to build a vision picking system. You just don’t need that.” [Anonymous]

## BARRIERS TO ENTRY IN PICKING ROBOTICS SECTOR (ILLUSTRATIVE)



Source: STIQ Ltd Research & Analysis

- While barriers to entry may come down, there is more likely picking specialism appearing

“I think picking automation is going to get commoditized, if not now, then maybe in a few years time... but at the same time I still think that there will be key differentiators. But that remains to be seen... the simple thing of looking at the scenes and maybe pick things up is probably commoditized. But whether you can do it for a difficult case like small objects or more challenging Cases? For perhaps 50 - 60% of logistics Cases it’s going to be commoditized. I think still very challenging for most. With commoditized I refer to more restricted settings. For an absolutely random situation, I think it’s going to be hard and it’s not going to be commoditized anytime soon.” [Eureka Robotics]



# EACH PICKING ROBOTS: CUSTOMERS APPEAR MORE DECISIVE WITH EVIDENCE OF DEPLOYMENTS MOVING FROM TRIALS TO PRODUCTION

## CUSTOMERS INCREASINGLY DECISIVE

- Customers are also increasingly knowledgeable and aware of what Eaches picking automation can do for them with a more decisive buying behaviour

**“When we talk to customers, they are starting to be more decisive in what they want to do with robot picking. I think this is tied to the overall maturity of the products and solutions that are being provided.” [NoMagic]**

**“I think the technology is starting to mature to the point now where people are recognizing that it can do a better portion of the use cases.” [Nexera Robotics]**

- Customers may also be more decisive as they have had more experience with ASRS systems and may also be looking at squeezing out further efficiencies

**“I think the proliferation of ASRS systems is definitely a big factor. Customers are now looking at what's the next step... I still want to point out that the maturity of robot picking solutions themselves probably has an impact.” [NoMagic]**

## IS THE SEGMENT REACHING CRITICAL MASS?

- There are a growing number of customers with relatively large deployments which may be evidence of market momentum

**“Our customers are eager to serve as references... a few years ago people were seeing 1-2 robots. Now they see multiple robots at the same site when they visit. That has definitely increased the confidence which also accelerates the sales process.” [NoMagic]**

**“Picking robots are somewhat new technology, and when a customer is interested, they also hear about some failed projects. Given that, a lot of these new customers start with 1-3 robots. And when they realize the value, they expand. That's still the trend.” [Righthand Robotics]**

- Younger vendors also continue to emerge

**“We are running a few commercial pilots at this moment.” [Yango Robotics]**

**“We have just released our robot to the market, have our 1st installation and one more in delivery. Now we are working on selling but it's pretty hard as we're new and there's a lot of uncertainty in the market right now... we are getting a lot of very nice response.” [Pickr]**

## NOT ALL CUSTOMERS AT SAME STAGE

- However, while some customers appear to have gained a level of understanding of each picking, others are at various different stages

**“An online retail client told us they want to solve moving items across the warehouse this year and next, and think about picking after that. I believe it's about maturity and prioritization, what customers think will really impact the business. Picking-robot projects are lengthy; the sales cycle is long, and you often pilot first, then scale.” [Yango Robotics]**

## PICKING ROBOT/ AUTONOMOUS BIN PICKING FROM ASRS SOLUTION



*Image source: NoMagic*

- Some vendors have also developed alternative products to assist with the process towards automated picking

**“The response from customers is varied. In brownfield implementations, there's a lot of processes where they're looking at automation. A robotic solution might not fit. So it's how can our computer vision, for example, allow them to automate more without a robot? And then the second step is going back to piece picking. Is the environment suitable for robotic piece picking?” [Fizyr]**



# EACH PICKING ROBOTS: PICKING ROBOTS OFTEN DEPEND ON OTHER AUTOMATION EQUIPMENT BEING DEPLOYED AND USED

## ROBOT PICKING AND THE ASRS

- The Robot Picking segment was strongly influenced by Amazon in the mid 2010s as they sought after something that could help them fully automate their ASRS (Kiva Systems) solutions
- This laid the ground for various optimistic picking robot forecasts based on ASRS system sales

**“In the item picking market, there was a perception for a long time that the juiciest portion of this was for the systems connected to ASRSs, automating the human picking. And then everybody realized a few years ago that’s a super hard problem. Because you have to be tied into the WMS and there’s all these other perturbations that happen in those systems that are really hard to account for. It’s only recently, I’d say even in the last year, 18 months where people are starting to make progress here.”** [Nexera Robotics]

- Selling a picking robot (for order picking) is near synonymous with picking from an ASRS system using storage totes

**“This ASRS is a popular piece of technology which standardised the mechanical interfaces... so it makes sense to work with integrators to do ecom picking. In industrial applications it often depends - it can be both through an integrator but also dealing directly with and training customers who want to automate picking processes.”** [Robominds]

**“Our customers are more likely ASRS customers. We started with VLM customers. But the price for a picking robot compared to a VLM is a little bit higher and customers are not used to investing so much money.”** [Arlog]

**“We’re focusing more on G2P because it’s an established market. The expected throughput is reasonable from our perspective. We just started going to market, let’s call it semi-actively, this year, and from a pipeline perspective it was quite a successful year..”** [Yango Robotics]

## THE INTEGRATION BARRIER

- Reading the screen output can be a shortcut to integrating a picking robot and improving the speed to deployment, often avoiding lengthy WMS integrations

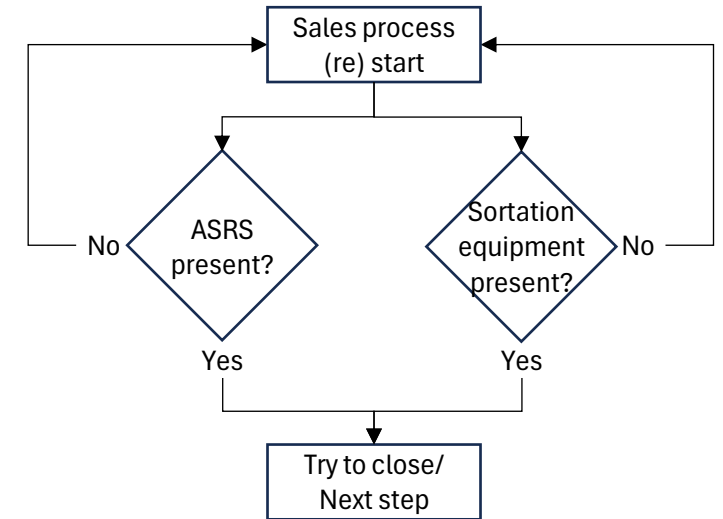
**“All we have to do is plug it in and then we are ready to go. We connect with an ASRS and then we can read out the screen output... the numbers and product name and what and where we have to pick. So we can mount our picking robot and install it in one day and then we are ready to go.”** [Arlog]

## MARKET DYNAMICS – ASRS & PICKING ROBOTS

- Multiple ASRS vendors have partnered with picking robot vendors to offer integrated picking robot solutions

**“One ASRS vendor really pushed picking robots in ecommerce applications... but this is also a limiting factor because they are now also pushing their own solutions into the market. It will be interesting to see how integrators will react. Because now they have their own solution and now they’re in competition with suppliers.”** [Anonymous]

## PICKING ROBOT SALES PROCESS OFTEN PENDING ON EXISTING AUTOMATION EQUIPMENT<sup>1</sup>



Source: STIQ Ltd Research & Analysis  
<sup>1</sup> Other applications may apply

## ROBOT PICKING – THE HOLY GRAIL?

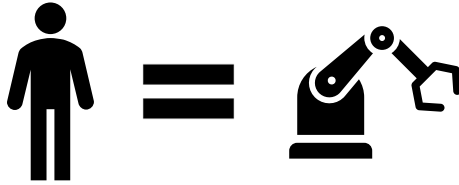
- Interviews suggest order picking may be the final puzzle piece to reach proper ‘dark stores’ with very few humans in fulfillment roles

**“Robotic order picking is maybe the last barrier for fully automated warehouses... some say it is the holy grail of warehouse automation. It’s a hard problem because everything can not be picked by automation... yet.”** [Pickr]



# EACH PICKING ROBOTS: ROBOTS AND HUMANS PICK AT SIMILAR RATES. OTHER FACTORS MAY PLAY INTO BUYING DECISIONS

## SIMILAR PICK RATE BETWEEN HUMAN AND PICKING ROBOT



Source: STIQ Ltd Research & Analysis

## ROBOTS ARE ON PAR WITH HUMAN SPEEDS

- Picking robots are generally viewed to have a similar performance to a human operator

**“A human and a picking robot have very similar speed.”**  
[NoMagic]

- However, focusing only on the pick rate can sometimes provide a skewed view as there may be other factors, such as weight, size, etc. or repetitive work involved

**“Pick rates really depend on a lot of variables. We can do up to 1,500 picks... but we also did applications where we handle payloads up to 30Kgs. And, obviously, at 30Kgs you won't be able to do 1,500 picks per hour. We're comparable to a human worker... but it really depends on where you put your focus. Is it heavy loads? Is it throughput? Is it emptying rate? Is it what is important for your process? Once we have that, we can maximise to the specific application.”**  
[Robominds]

- Pick rates also depend on external factors and the speed of other systems in the process which are picked from, and placed to

**“When you have a stationary picking robot, picking from bin to bin with an ASRS system, then the throughput entirely depends on the bin presentation rate from the ASRS.”**  
[Pickr]

- For ASRS systems there are two picking processes involved and nearly all picking robot vendors target picking to orders rather than induction/replenishment as this frequently involves humans taking multiple items in one go

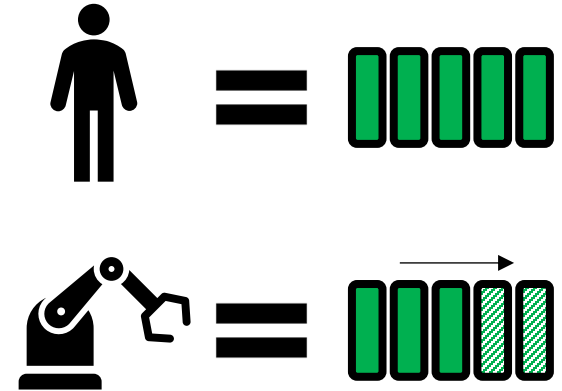
**“We can comfortably match human pick rates for G2P picking. Induction to an ASRS is different, humans often take many items per pick when doing induction, so it's hard to compare.”** [Yango Robotics]

## COBOTS, PICKING ROBOTS AND SAFETY

- Plenty of picking robot vendors sell their picking cells with Cobots and these are often deemed 'safer' than industrial robots by some end customers
- However, most picking robots will be fenced off for health & safety reasons as robots are optimized for performance and not for frequent swapping between human and robot

**“All robotics systems need to have safety risk assessments. At the end of the day, when customers buy our robots, they are interested in high throughput. They are not buying it to operate next to humans. Our systems are optimized for performance. All of our robots have safety cages.”**  
[Righthand Robotics]

## HUMANS CAN PICK EVERYTHING, EVERY TIME



Source: STIQ Ltd Research & Analysis

## HUMANS CAN PICK EVERYTHING, EVERY TIME

- Humans are more flexible and can adapt to changes in situations with relative ease, although robots are still evolving

**“A human can pick every thing, every time.”** [Anonymous]

- One market inhibitor is the current relatively limited impact an each picking robot has on operational costs

**“Look at what you're actually displacing... low value labor. You're displacing \$30/hr. You're not bringing in an ASRS which is displacing 50 people or whatever, you're bringing in a robot, which displaces 1 person per robot.”** [Anonymous]



# EACH PICKING ROBOTS: MANY PICKING ROBOTICS VENDORS RETAIN A FLEXIBLE GTM APPROACH WORKING WITH BOTH SYSTEM INTEGRATORS AND END CUSTOMERS

## FLEXIBLE PICKING ROBOT GTM STRATEGY

- Many picking robot vendors are relatively flexible with their GTM strategy and work via System Integrators and/or directly with end customers

**“We partner with system integrators and work direct... Both approaches are very important. Some customers are more comfortable working with system integrators while others are comfortable working directly with us... we have been flexible and adjust to the buying approach of the customers.” [Righthand Robotics]**

- Working with System Integrators may require quite clear rules of engagement

**“We have clear rules of engagement to make sure we have a good relationship with systems integrators. But we also think that it's important to be able to work directly with some customers who are big enough and want to manage projects by themselves.” [NoMagic]**

- Other vendors exclusively provide a software stack to System Integrators

**“I would define ourselves as B2B2B, meaning kind of like the Intel inside model that we want Fizyr inside the robot syndicator, we want them to be utilising our technology to build best of breed solutions.” [Fizyr]**

## FLEXIBILITY IN PICKING ROBOT GTM STRATEGIES

### Preferred Business Model<sup>1</sup>



- Picking robot software only vendor, no involvement in robot arm or end of arm tool selection
- Application entirely controlled by System Integrator and End Customer

### Frequently Used Business Model



- System Integrators may not be interested in smaller projects
- Picking robot software vendor creates picking cell internally and supply directly to end customer

**“Our strategy is essentially to be the eyes and the brain for the robot. The vision system, it's the ability to get a 3D understanding of the world and then make a judgment about how to interact with it. Our partners design robotic workstations.” [Covariant]**

Source: STIQ Ltd Research & Analysis

<sup>1</sup> Interviews hint to this as the preferred business model, i.e. only software vendor



# EACH PICKING ROBOTS: DESPITE SIMILARITIES INDUSTRIAL AND WAREHOUSE APPLICATIONS OFTEN REQUIRE DIFFERENT SKILL SETS AND TECHNOLOGIES

## INDUSTRIAL VS WAREHOUSE (ASRS) PICKING ROBOTS



Source: STIQ Ltd Research & Analysis. From left [Robominds/UR](#), [NoMagic/UR](#)

## WAREHOUSE VS INDUSTRIAL PICKING ROBOTS

- There are key differences between warehouse picking robots and those deployed in industrial settings
- Industrial picking robot applications tend to be very individual, often depending on the item/s to be picked, the down- and up-stream product flows and the frequently heavier loads when compared to ecommerce picking

**“E-commerce picking is frequently around light loads and packaged goods, whereas in industrial applications we see payloads are often heavier and unpackaged. For industrial picking we need to figure out what parts we are dealing with, how the supplier usually delivers parts, and the parts variance... controlling the suppliers is also one important aspect in industrial applications.” [Robominds]**

- Industrial picking robotics is also typically far more demanding in terms of the pick and place location and direction of items, etc.

**“In logistics, you can drop something and then when you pick things up, you don't have to be very precise. But the manufacturing is a lot harder and you have to pick very precisely in order to do the downstream tasks. Sometimes you have to pick in exactly the same way so that you can put it in a rack or whatever.” [Eureka Robotics]**

- Warehouse (logistics), or ecommerce, picking can often be scaled easier

**“From a scaling perspective, finding one application that can be replicated as well as possible... in general it's mostly fashion ecom that can be replicated quite easily. Especially when compared to most industrial applications which are in general more specialised. There we need to take a deeper look at the parts of the work pieces and the process.”**

**[Robominds]**

**“In logistics, you probably want somewhat like a human level of understanding. More generalised. But in a manufacturing setting, you don't want that because you want to do the same thing all over - you have one part and you want to handle it in one way. That's a very important difference that leads to a different technology choice.”**

**[Eureka Robotics]**



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<b>CONTENTS</b>	<b>PAGE</b>
<b>EXECUTIVE SUMMARY</b>	2
<b>MARKET INTRODUCTION &amp; SEGMENTATION</b>	3
<b>CASES VS EACHES PICKING</b>	10
<b>MARKET GROWTH</b>	15
<b>PICKING TECHNOLOGIES</b>	20
<b>MANUAL+ (AIDC, PTL, SOFTWARE, ETC.)</b>	22
<b>ROBOT PICKING (EACHES)</b>	31
<b>ROBOT PICKING (CASES)</b>	39
<b>HUMANOID PICKING</b>	43
<b>SECTOR DEMOGRAPHICS</b>	46
<b>VENDOR DIRECTORY</b>	49
<b>CREDITS &amp; LIST OF INTERVIEWS</b>	55

# CASE PICKING ROBOTS: CASE PICKING OVERLAPS WITH CONTAINER UNLOADING AND PALLETIZATION BUT SOLUTIONS ARE APPLICATION SPECIFIC

## CASE PICKING, DIRECT FROM RACK POSITION



Image source: [Solwr](#) (Grab)

## CASE PICKING, CONTAINER UNLOADING



Image source: [Pickle Robot](#)

## CASE PICKING, PALLETIZATION



Image source: [EazyRobotics](#)

## CASE ORDER PICKING (WHOLESALE)

- Case picking is typically directly from rack storage positions directly on to a pallet (see image above) and many include many different SKUs

**“It’s more wholesalers who are interested in Grab. The reason is simple, vendors they usually ship full pallets. For mixed pallets it’s usually the wholesaler part.” [SOLWR]**

## CASE UNLOADING & LOADING

- Unloading of containers offers a limited footprint to operate in with a wide variety of quality, weights, sizes, etc. of Cases

**“If you can unload cartons, can you palletize them too? And today our answer is we’re not going to go after that palletization. We want to stay focused on unloading.” [Pickle]**

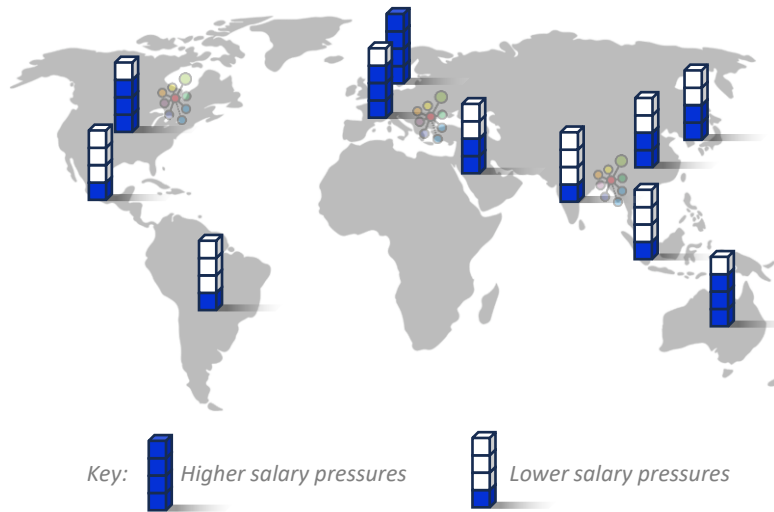
## CASE PALLETIZATION

- Palletization installations vary tremendously depending on upstream and downstream handling
- For example, production output can be very uniform with exact sized Cases every time which can offer optimization opportunities when palletizing
- In order picking use cases, there can be one layer of one SKU and another layer with another SKU further on to individual Cases which adds palletization complexity



# CASE PICKING ROBOTS: EARLY POSITIVE TRACTION WITH LIMITED QUANTITIES. INTERESTING PROCESS CHANGES AT CUSTOMERS

## STIQ LTDs COMPARATIVE GLOBAL WAREHOUSE SALARY PRESSURE MAP (\$)



Source: STIQ Ltd Research & Analysis. Interviews

## EARLY TRACTION FOR CASE PICKING

- Case picking (including wholesale and unloading) appears to be experiencing early positive traction

**“Grab is available in multiple locations and we have systems running in Norway and the UK. There are a few more being deployed after the summer holidays.” [SOLWR]**

**“Customers are expanding. One has gone from 1 site 1 robot to 3 sites with multiple robots... they're out of pilot into production.” [Pickle]**

- A level of seasonality with case container unloading may stretch out the adoption curve for this technology

**“There is a level of seasonality to customer buying behaviour as few want to bring in new automation during the holiday window. That slows down some of the deployments as our opportunity window is somewhat condensed.” [Pickle]**

## ROI VS FINDING PEOPLE

- While ROI can be relatively low in higher cost countries, such as Scandinavia, in other countries they may simply struggle with finding people to work in warehouses with ROI almost a secondary issue

**“We presented to customers in the UK and they said if there's an ROI for 2 yrs in Norway, it might be more than 3 in the UK. But they also told us that it doesn't really matter, because they can't find people to work in their warehouses. The business case is positive with an ROI of c.3 years, but it could be 5 years... doesn't really matter because they can't get people to work in their warehouses. That's why we're getting a lot of interest.” [SOLWR]**

## EVOLVING BUSINESS MODELS

- As for many startups in the MHE space, the business model remains relatively flexible and evolving often depending on customer's situation

**“One customer said they are going to do leasing on their own. Another asked us to have the leasing ready. Right now we offer both. Our understanding is in Norway it's still pretty common to do Capex, but in other markets like in the UK, there is much more appetite for as-a-service. First, we want to do leasing. But we are also discussing rental, which could be a short to midterm. It's a good way to get started, especially when you are a young company, because people can try it out. And then when customers see the system working, they will keep it.” [SOLWR]**



# CASE PICKING ROBOTS: CHANGE MANAGEMENT IS OFTEN LENGTHY, BUT A VERY IMPORTANT PART OF SUCCESSFUL PROJECTS

## CASE PICKING EFFICIENCY IMPROVEMENTS

- Case picking robots operate on par with human pickers but have the theoretical advantage of operating longer hours at unimpeded efficiency

**“I would say the first container of the day that the person does, we're on par with human workers... but for the last container, about the 3<sup>rd</sup> container, that person is working a lot slower and we're still in there unloading at the same rate.” [Pickle]**

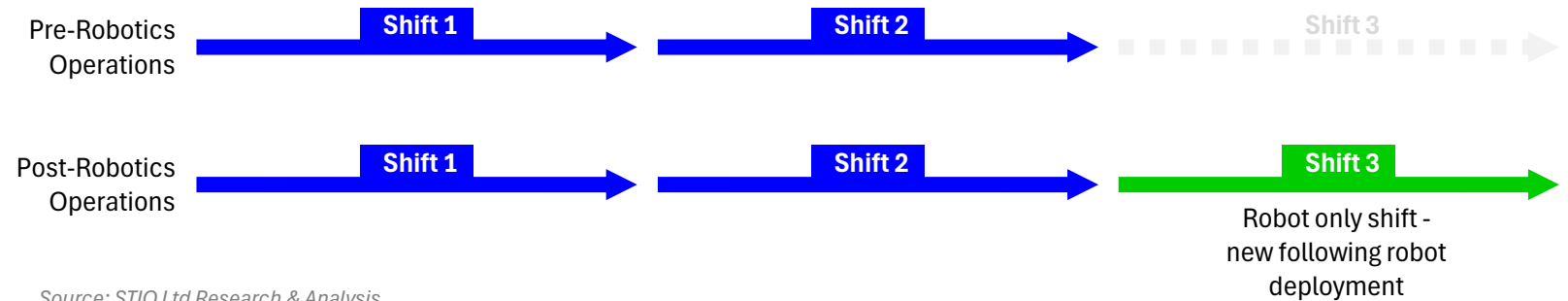
- New automation solutions may also trigger positive changes to existing processes, for example implementing relay picking where robots pick heavier items during the night

**“Grab can replace more than 1 manual picker... it can operate up to 20 hours a day. But more than that, we see our customers are using Grab to take some of the strain of the manual pickers to do the heavy lifting. We also see that some customers use it for relay picking. So Grab picks heavy items in an order and then there's some light items by a manual picker while other customers do full orders with Grab.” [SOLWR]**

- For example, some customers have implemented a 3<sup>rd</sup> automated shift to relay-pick with a focus on heavier items

**“Customers have 1-2 shifts at this stage. Some are also implementing a night shift for Grab to do relay picking so that when the workers starts in the morning, they have a number of pallets that have been pre-picked that they just have to finish. It's kind of preparation for the day shift.” [SOLWR]**

## PROCESS CHANGES POST-CASE PICKING ROBOTICS DEPLOYMENT



Source: STIQ Ltd Research & Analysis

## CHANGE MANAGEMENT IS OFTEN ARDUOUS

- Change management can be a lengthy process and often involves a variety of different levels of workers from pickers to management

**“Change management takes time so even if we would be ready to pick in 3 days, the warehouse, the workers and the system won't be ready on the customer's side, because they need to prepare for the new process. We are working on how to support the customers to be faster in their process changes and change management.” [SOLWR]**

- Multiple interviews for various reports have highlighted that change management and buy in at senior management level is paramount to the success of automation projects

- This may also be further elongated if customers initiate other process changes during early stages of a project



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<b>CONTENTS</b>	<b>PAGE</b>
<b>EXECUTIVE SUMMARY</b>	2
<b>MARKET INTRODUCTION &amp; SEGMENTATION</b>	3
<b>CASES VS EACHES PICKING</b>	10
<b>MARKET GROWTH</b>	15
<b>PICKING TECHNOLOGIES</b>	20
<b>MANUAL+ (AIDC, PTL, SOFTWARE, ETC.)</b>	22
<b>ROBOT PICKING (EACHES)</b>	31
<b>ROBOT PICKING (CASES)</b>	39
<b>HUMANOID PICKING</b>	43
<b>SECTOR DEMOGRAPHICS</b>	46
<b>VENDOR DIRECTORY</b>	49
<b>CREDITS &amp; LIST OF INTERVIEWS</b>	55

# HUMANOID PICKING ROBOTS: NASCENT TECHNOLOGY WITH POTENTIAL THAT IS CURRENTLY BEING TRIALLED

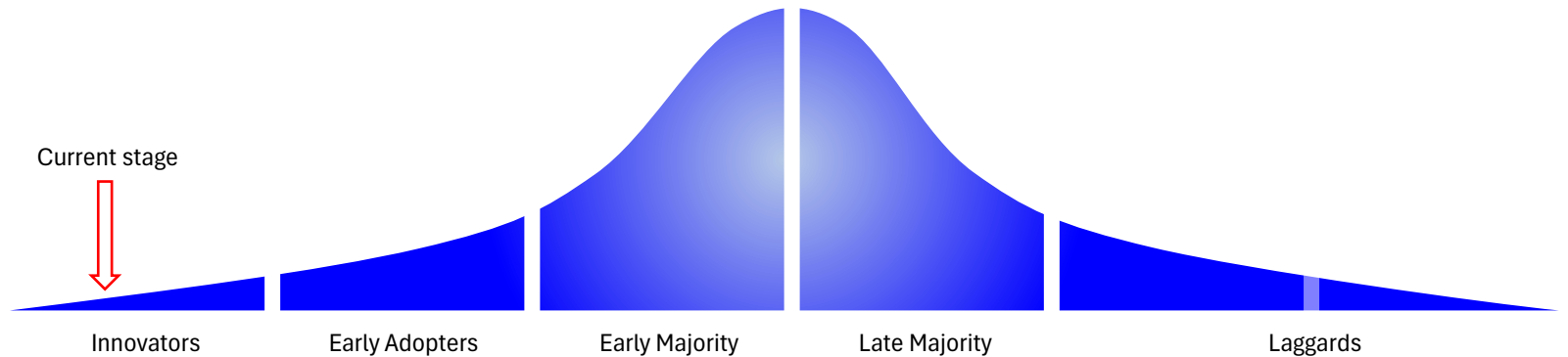
## HUMANOIDS ENTERING (SLOWLY)

- The premise of humanoids (bipedal and wheeled) is their inherent suitability for work tasks performed by humans with their two arms, hands, etc.

**“You have the Amazons of the world where they have spent \$100m’s with completely robotic fulfillment end-to-end. And then you have 20,000 SMB size 3PLs in the US where they have a warehouse and rent out space. Those 3PLs do not want to pay upfront fixed cost of a conveyor going to a robot picker or a fixed palletizer... because they don’t know what contract they’re going to have in 2 years time. They might have a contract for shoes now and in 6 months time they might be doing cosmetics. They don’t want fixed infrastructure. That’s where our solution excels. Customers can move it between warehouses, they can do different tasks in the morning and it could be unloading in the evening, it could be sorting... Obviously, a fixed robot pick station is going to be faster. But then you get the problem of your warehouse space and layout and your flow has been dictated.” [Kinisi]**

- Amazon indirectly pushed significant innovation in the ASRS space with a large number of new startups in the market following their acquisition of Kiva systems in 2012
- However, there is no single ‘Amazon’ in the humanoids market driving innovation and the market may be ‘finding its own legs’

## HUMANOID PICKING TECHNOLOGY ADOPTION LIFECYCLE



Source: STIQ Ltd Research & Analysis

## HUMANOID TRIALS + PILOTS

- Early adopters are driving trials and pilots with humanoid technologies (bipedal and wheeled base)

**“We’ve signed up a couple of pilot projects starting in end 1Q25 in the US.” [Kinisi]**

**“The 2025 market is absolutely doing initial trials. No one had money set aside in 2025 for humanoid technology, being very open and frank about it. Everyone is either finding pennies to do trials and demonstrations or they’re asking vendors to bring their equipment.” [Reflex Robotics]**

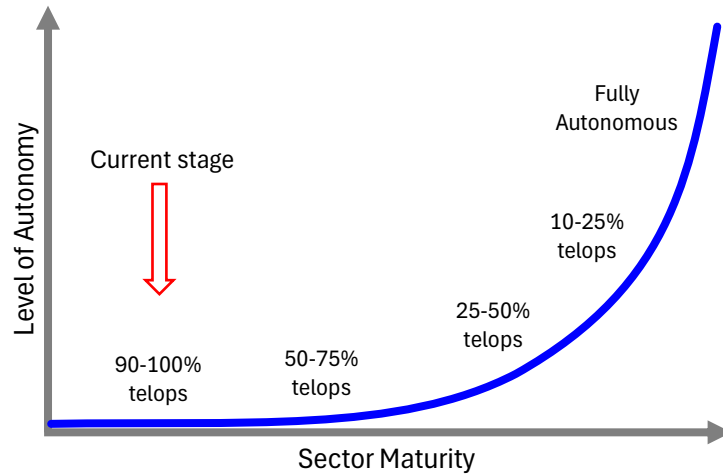
**“But the interesting thing is that I have 10+ customers that I’m working with right now... they have come back to us and said we have proven what is needed. Jointly have certified the workflows, proven the technology and have put money aside for you 2026... We are now beyond the point of interest.” [Reflex Robotics]**

**“We are picking Cases and Eaches for orders. We are not only going to ASRS systems and pulling items directly out of a tote, but we’re also going into the aisles and to their shelves and grabbing individual boxes, cutting opening boxes if needed, and then each picking out of the box or taking the inner packs. We even have the ability to open the inner packs and grab eaches out of them and put them into the orders bags as well..” [Reflex Robotics]**



# HUMANOID PICKING: CURRENT HUMANOID SYSTEMS LARGELY BASED ON TELEOPS

## HUMANOIDS AND AUTONOMY LEVELS



Source: STIQ Ltd Research & Analysis

“Customers want us to do palletizing, depalletizing, pick walls - tasks that are very well defined. Our end goal is using an AI approach where the customer can tell a robot the same as they would a person how to do a task. But that technology is still 5yrs away. Our approach is stepping stones. To start with it will be 20% AI and 80% using classical control. Over the next couple of years you'll slowly be replacing some of these hard-coded routines with a more generalist approach.” [Kinisi]

- Fully autonomous systems may come at some point, but are most likely a 5-10 years away
- Check out STIQs report on [Humanoids](#)

## MAINLY TELEOPERATED HUMANOIDS

- While there is great potential for fully autonomous humanoids, most (if not all) of the current crop of providers on the market teleoperate their systems with varying degrees of machine learning (AI)

“We call it Supervised Autonomy... the marriage of teleoperation plus artificial intelligence at the same time. Good work is economically achievable today because of Supervised Autonomy.” [Reflex Robotics]



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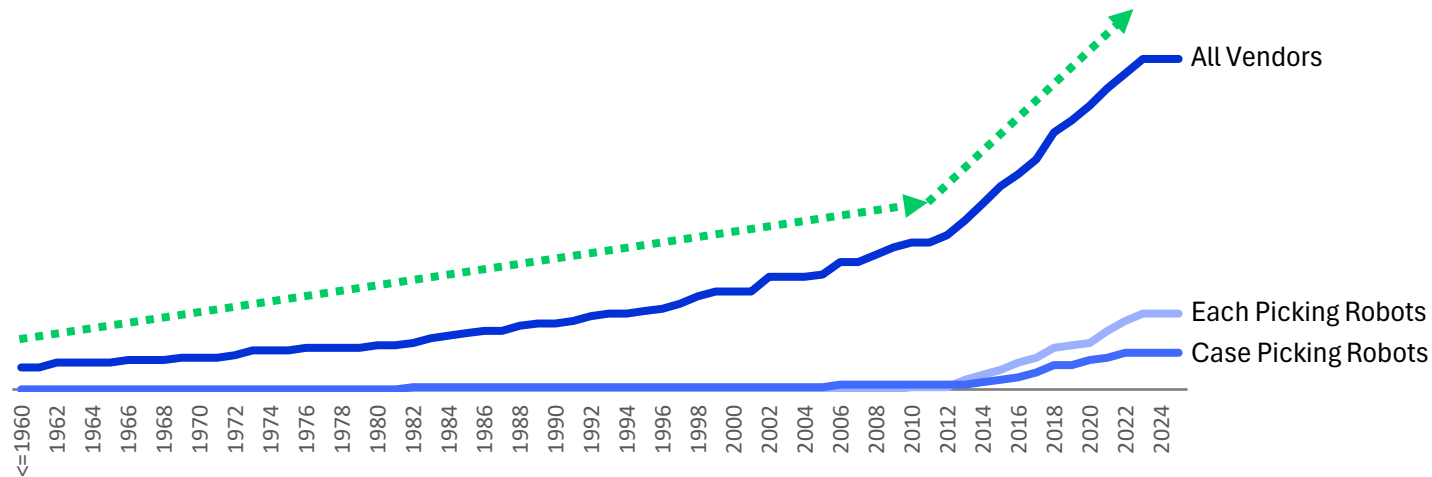


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<b>CONTENTS</b>	<b>PAGE</b>
<b>EXECUTIVE SUMMARY</b>	2
<b>MARKET INTRODUCTION &amp; SEGMENTATION</b>	3
<b>CASES VS EACHES PICKING</b>	10
<b>MARKET GROWTH</b>	15
<b>PICKING TECHNOLOGIES</b>	20
<b>MANUAL+ (AIDC, PTL, SOFTWARE, ETC.)</b>	22
<b>ROBOT PICKING (EACHES)</b>	31
<b>ROBOT PICKING (CASES)</b>	39
<b>HUMANOID PICKING</b>	43
<b>SECTOR DEMOGRAPHICS</b>	46
<b>VENDOR DIRECTORY</b>	49
<b>CREDITS &amp; LIST OF INTERVIEWS</b>	55

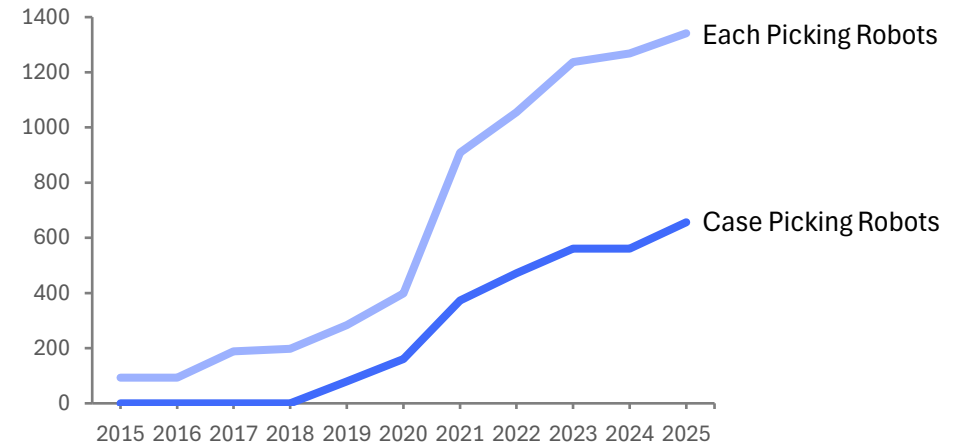
# DEMOGRAPHICS: ACCELERATING VELOCITY OF NEW STARTUPS IN 2010s. COVID SUPER CHARGED INVESTMENTS IN PICKING ROBOTICS (EACHES + CASES)

**NEW COMPANIES/VENDORS IN THREE DISTINCT ACCELERATION PHASES, 1960-2025 (#)**



Source: STIQ Ltd Research & Analysis. By year founded. May be different to year added product/service.

**AGGREGATED SECTOR FUNDRAISING, PICKING ROBOTICS COMPANIES, 2015-2025 (\$M)**



Source: STIQ Ltd Research & Analysis

## ACCELERATING NUMBER OF NEW VENDORS

- From the 1960s up to about 2010, there were a steady number of new entrants
- This accelerated fast just after 2010 and is thought to be related to Amazon's acquisition of Kiva Systems in 2012
- A few years after acquiring Kiva Systems, Amazon ran a number of picking robotics competitions with the apparent aim of fully automating warehouse fulfillment processes
- This acted as a catalyst for plenty of new startups focusing on each picking robots

- At the peak of the each picking robotics trend, STIQ tracked about 50-60 vendors, however, this has declined with limited market traction initially
- As vendor numbers have declined, there has been increased post-Covid market traction for these solutions
- Around the same time, case picking (excl palletization) automation began gaining traction as well

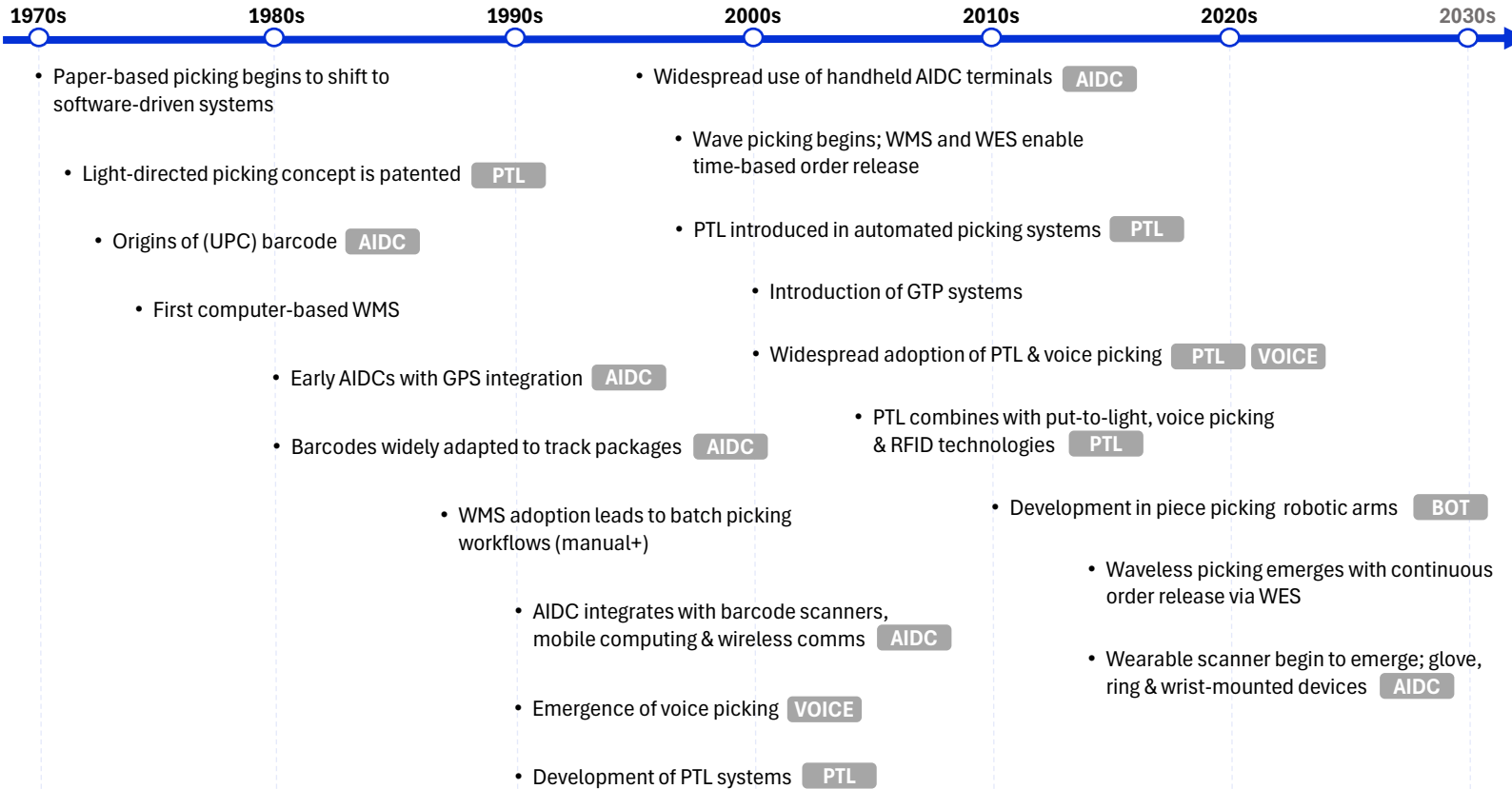
## COVID ACCELERATED ROBOTICS FUNDRIASING

- Covid appears to have sharpened investor expectations of potential returns with a massive influx of funding , especially in each picking robotics companies during the early part of the pandemic
- This analysis does not include humanoids, covered in [STIQs Humanoids report](#)



# DEMOGRAPHICS: HISTORICAL OVERVIEW OF THE DEVELOPMENT OF PICKING TECHNOLOGIES

## HISTORY OF PICKING TECHNOLOGIES (NOT EXHAUSTIVE)



## WAREHOUSE PICKING TECHNOLOGIES

- The history of warehouse picking technologies shows a progression from manual methods toward increasingly automated and collaborative solutions
- While the timeline is not exhaustive, it highlights the main innovations that continue to shape the industry today
- The early stage here evolves from manual picking, which remains in use, to the introduction of transitioning technologies
- Examples include AIDC technologies bringing significant improvements in the warehouse industry
- Extending these innovations, PTL and voice technologies emerge as an additional way to guide picking workers
- More recently, the focus shifts toward robotics, with piece-picking robots representing a step change in how items are retrieved and handled
- These technologies remain at varying stages of adoption, but they demonstrate the trajectory moving forward

Source: STIQ Ltd Research & Analysis. Automation Experts. Baudin. Borangiu and Dumitrache. Business Insider. Free Barcode. Hernandez. Logistics Reply UK. LUCA Logistic Solutions. Meegle. Medium. Modern Materials Handling. Newcastle Systems. NOVA. Pace. Sinsmart. Vogue Business. Weightman. WMS Insights.



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<b>CONTENTS</b>	<b>PAGE</b>
<b>EXECUTIVE SUMMARY</b>	2
<b>MARKET INTRODUCTION &amp; SEGMENTATION</b>	3
<b>CASES VS EACHES PICKING</b>	10
<b>MARKET GROWTH</b>	15
<b>PICKING TECHNOLOGIES</b>	20
<b>MANUAL+ (AIDC, PTL, SOFTWARE, ETC.)</b>	22
<b>ROBOT PICKING (EACHES)</b>	31
<b>ROBOT PICKING (CASES)</b>	39
<b>HUMANOID PICKING</b>	43
<b>SECTOR DEMOGRAPHICS</b>	46
<b>VENDOR DIRECTORY</b>	49
<b>CREDITS &amp; LIST OF INTERVIEWS</b>	55

# DIRECTORY: A-D

Accuspeech  
US | 2006

- Voice pick

Agility Robotics  
US | 2015

- Humanoid

AIOI  
JP | 1999

- PTL vendor

aiOla  
IL | 2019

- Voice pick

Ambi Robotics  
US | 2018

- Robot picking

Arlog  
DK | 2023

[W](#) [in](#)



- Robot picking

atop Technologies  
TW | 1989

- PTL vendor

AWL  
NL | 1993

[W](#) [in](#) [v](#)



**Robotic Item & Piece Picking**

- Easily implementable in existing and new environments
- Picking accuracy of 99.9%
- User-friendly HMI
- Free up your staff for more varied tasks.

Retail & E-commerce   Groceries   Parcel & Post Distribution   3PL   Warehousing

Boa Concept  
FR | 2012

- Robot picking

Boreal Technologies  
AR | 2002

[W](#) [in](#)

- Handheld AIDC

Brain Corp  
US | 2009

- Robot picking

Brightpick  
SI | 2013

- Robot picking

Cambrian Robotics  
UK | 2018

- Robot picking

Captron  
DE | 1983

- PTL vendor

CMES  
US | 2014

- Robot picking

Cognibotics  
SE | 2013

- Robot picking

Covariant  
US | 2017

[W](#) [in](#)

- Robot picking

Crown  
US | 1945

- Forklift vendor

Dapster  
US | 2020

- Robot picking

DCA Design International  
UK | 1960

[W](#) [in](#)

- Industrial design

Dexterity  
US | 2017

- Robot picking



# DIRECTORY: E-L



Engineering Innovation  
US | 2006

- PTL vendor

EPG  
DE | 1995



- Voice pick

Eureka Robotics  
SG | 2018



- Robot picking

Exotec  
FR | 2015



- ASRS Solution provider

Find & Order  
FR | 2015

- SDP vendor

Fizyr  
NL | 2014

- Software



FLBots  
CN | 2020

- PTL

Futura  
RS | 2022

- Robot picking

Guidance Automation  
UK | 1991

- PTL

Honeywell  
US | 1988

- AIDC vendor

Hummingbird Systems  
US | 2022

- Robot picking

Illumo Robotics  
FR | 2021

- Robot picking



Invia Robotics  
US | 2015

- Software

item industrietechnik  
DE | 1973

- PTL

Kinisi Robotics  
US | 2023

- Humanoid

Infios  
DE | 2023

- Voice pick

**KBS Industrieelektronik GmbH**  
DE | 1979

  **KBS**  
KBS Industrieelektronik GmbH

**Pick to Light. Perfected by KBS.**  
Faster, easier and more accurate order picking – powered by 40 years of innovation. From workstation and shelf systems to put-walls, ASRS, and mobile solutions – KBS delivers efficiency that shines.



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Lightspeed  
US | 2008

- PTL

Locus Robotics  
US | 2014

- P2G vendor

Lotwork  
US | 2023

- Wearable AIDC

Lully  
US | 2023

- Software

# DIRECTORY: M-P

**Matthews Automation**  
US | 1998

W in



**PRECISION IN MOTION.  
FULFILLMENT AT LIGHT SPEED.**

Matthews Automation's Lightning Pick is the leading technology for pick-to-light, put walls, smart carts, RF picking, and other paperless picking systems.

For over 25 years, Lightning Pick has improved the speed and accuracy of picking, kitting, assembly, and sorting operations in supply chains worldwide.



**99%** ACCURACY RATE

**40%** PRODUCTIVITY INCREASE

**MORE** THROUGHPUT + SCALABILITY

**Mech Mind**  
CN | 2016


- Robot picking

**Metalprogetti**  
IT | 1980

- PTL



**NoMagic**  
PL | 2017

W in



**Learn how AI-powered robots can optimize your warehouse operations**

Scan the QR code to discover our solutions for **picking, packing and sorting**

**Nimble Robotics**  
US | 2018

- Robot picking
- Pivoted into a 3PL operator

**Nido Automation**  
IN | 2010

- PTL

**MILTZ GmbH**  
DE | 2013

- Picking trolley vendor

**Nexera Robotics**  
CA | 2021

W in

- Robot picking

**Opticon**  
NL | 1976

- Handheld AIDC

**Osaro**  
US | 2015

- Robot picking

**Pickle Robot Company**  
US | 2018

W in



**Physical AI for Supply Chain Automation**

Robotic Truck Unloading | ROI in 18 Months  
Trailers & Containers | +600 Picks Per Hour  
No System Integrations Required



**Ottenlux**  
CN | 2008

- Robot picking

**Ox**  
US | 2019

W in

- Software

**pcdata**  
NL | 1988

- Robot picking

**Pelican Robotics**  
US | 2022

- Robot picking

# DIRECTORY: P-S

**Pickr**  
NO | 2016

[W](#) [in](#)

**PICKR**  
.AI

**The next generation of piece-picking has arrived**

Pickr delivers the most **cost-effective and easy-to-integrate** robotic picking solution on the market.

It **retrofits seamlessly** into VLMs, Cube Storages, Zone Picking setups and more.

It works across multiple ports and systems, offering true **many-to-many picking** without one-to-one limitations.

It picks vertically and horizontally and can even **move bins** for a fully automated flow.

[www.pickr.ai](http://www.pickr.ai)



**Pick To Light Systems**  
ES | 2002

[W](#) [in](#)

- PTL

**Pickcommerce**  
IL | 2022

- Robot picking

**ProGlove**  
DE | 2014

[W](#) [in](#) [YT](#)

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**Pickitoo**  
LT | 2019

[W](#) [in](#)

- Software

**Picksmart**  
CN | 2017

- PTL

**Picovoice**  
CA | 2018

- Voice pick

**Plus One Robotics**  
US | 2016

- Software

**Reflex Robotics**  
US | 2022

[W](#) [in](#)

- Humanoid picking

**RightHand Robotics**  
US | 2015

[W](#) [in](#)

- Robot picking

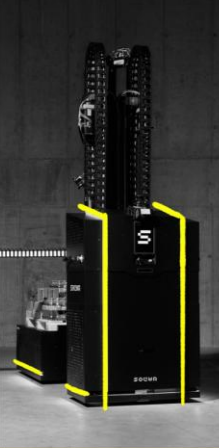
**Solwr AS**  
NO | 2013


[W](#) [in](#) [YT](#)

**SOLWR**

**Grab™ the mobile picking robot**

- Automate the entire case picking process.
- Handle heavy items, improve operators' conditions
- Plug n play in your existing infrastructure
- Cohabite with manual operators



 **Lars Eilertsen**  
Business Development Manager  
[lars.eilertsen@solwr.com](mailto:lars.eilertsen@solwr.com)

**Roboe Technologies**  
KR | 2021

- Robot picking

**Robominds**  
DE | 2016

[W](#) [in](#)

- Software

**Sekisui Jushil**  
JP | 1954




- Picking trolley vendor

**Shenzhen Ruiyibo**  
CN | 2009

- PLT

# DIRECTORY: S-Z

ShipHero  
US | 2013




  

- Software

Sophia Lighting  
CN | 2009

- PTL

The Rubic  
CA | 2020

- Robot picking

Vicarious  
US | 2010

- Robot picking

Unitech Electronics  
TW | 2008

- Handheld AIDC

Vuzix Corporation  
US | 1997

- AR Picking

Würth  
DE | 1945

- PTL

Xpand  
IL | 2021

- Robot picking




XYZ Robotics  
CN | 2018

- Robot picking

TWI Germany  
DE | 2023

- PTL

Vivoka  
FR | 2015

- Voice pick

VCO Systems  
US | 2012

- PTL

Yango Robotics  
AE | 2023

- Robot picking

Zebra Technologies  
US | 1969

- Wearable AIDC

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- Senior management follow STIQs reports

**"I enjoy the reports STIQ creates. We recently went through an integrator assessment to define partners, and the report had a lot of good insights. We also appreciated the view of the tiers of integrators, as that is how we are looking to establish and define when we use certain partners." [Engineering Director, Anonymous \$bn's 3PL]**

- (Quote from August 2025 feedback via LinkedIn)



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<b>CONTENTS</b>	<b>PAGE</b>
<b>EXECUTIVE SUMMARY</b>	2
<b>MARKET INTRODUCTION &amp; SEGMENTATION</b>	3
<b>CASES VS EACHES PICKING</b>	10
<b>MARKET GROWTH</b>	15
<b>PICKING TECHNOLOGIES</b>	20
<b>MANUAL+ (AIDC, PTL, SOFTWARE, ETC.)</b>	22
<b>ROBOT PICKING (EACHES)</b>	31
<b>ROBOT PICKING (CASES)</b>	39
<b>HUMANOID PICKING</b>	43
<b>SECTOR DEMOGRAPHICS</b>	46
<b>VENDOR DIRECTORY</b>	49
<b>CREDITS &amp; LIST OF INTERVIEWS</b>	55

# CREDITS, EVENTS & GLOSSARY

## STIQ INTERVIEWED THESE STAKEHOLDERS

- Arlog (DK) CEO
- **AWL (NL)** Director Strategy & Development
- Boreal Tech (AR) CRO
- Covariant (US) CEO
- DCA Design (UK) Head of Research (Human Factors)
- Eureka Robotics (SG) CTO
- Exotec (FR) EVP
- Find & Order (FR) Founder
- Fizyr (NL) CEO
- Guidance Automation (UK) CEO
- **KBS Industrieelektronik (DE)** Sales Manager
- Kinisi (US) CEO & Founder
- **Matthews International (US)** VP/GM Lightning Pick
- Nexera Robotics (CA) CEO
- **NoMagic (PL)** COO, Co-Founder
- Ox (US) CEO
- **Pickle Robot (US)** VP of Product & Marketing
- Pickitoo (LI) Head of Strategy
- **Pickr (NO)** CEO
- **ProGlove (DE)** Chief of Staff
- PTL Systems (ES) Distribution Automation Director
- Reflex Robotics CSO
- RightHand Robotics (US) CEO
- Robominds (DE) CEO & Co-founder
- The Rubic (CA) CEO & Founder
- ShipHero (US) VP of Product

- **Solwr (NO)** Chief Growth Officer
- Vivoka (FR) CEO
- Yango Robotics (UA) Global Business Development, Robotics

## ANONYMOUS CONTRIBUTORS:

- A few stakeholders requested to remain anonymous and STIQ is very grateful for their valuable contributions
- If you wish to participate in a STIQ report but prefer to remain anonymous, please simply let us know; We receive many incoming inquiries from a wide range of stakeholders with comments on our range of reports

## TRADE SHOWS & EVENTS VISITED

- Automate (varies, US) [Website](#)
- CeMAT Asia (Shanghai, CN) [Website](#)
- IMHX (Birmingham, UK) [Website](#)
- LogiMAT (Stuttgart, DE) [Website](#)
- LogiMAT SEA (Bangkok, TH) [Website](#)
- Logis Tech Tokyo (Tokyo, JP) [Website](#)
- Logistics & Automation (Madrid, ES) [Website](#)
- Logistik & Transport (Gothenburg, SE) [Website](#)
- Manifest (Las Vegas, US) [Website](#)
- Modex (Atlanta, US) [Website](#)
- MTC Robotics & Automation (Coventry, UK) [Website](#)
- NRF Big Show (New York, US) [Website](#)
- Parcel & Post (Amsterdam, NL) [Website](#)
- Promat (Chicago, US) [Website](#)
- Shoptalk Europe (Barcelona, ES) [Website](#)
- Viva Technology (Paris, FR) [Website](#)

## GLOSSARY/ ACRONYMS USED IN THIS REPORT

- |          |                                             |
|----------|---------------------------------------------|
| AIDC     | Automatic Identification & Data Capture     |
| AMR      | Autonomous Mobile Robot                     |
| AGV      | Automatic Guided Vehicle                    |
| AI       | Artificial Intelligence                     |
| AS       | Asia                                        |
| ASRS     | Automatic Storage & Retrieval System        |
| CAGR     | Compound Annual Growth Rate                 |
| CPG/FMCG | Consumer Packaged Goods (US/UK)             |
| EU       | Europe                                      |
| FC       | Fulfilment Centre                           |
| G2P, GTP | Goods to Person                             |
| GPS      | Global Positioning System                   |
| H&S      | Health & Safety                             |
| M&A      | Mergers & Acquisitions                      |
| MHE      | Material Handling Equipment                 |
| ML       | Machine Learning                            |
| NA       | North America                               |
| P2G      | Person to Goods                             |
| PDA      | Personal Digital Assistant                  |
| POC      | Proof of Concept                            |
| PPS      | Projection Picking System                   |
| PTL      | Pick To Light                               |
| RAAS     | Robotics As A Service                       |
| RFID     | Radio Frequency Identification              |
| ROI      | Return On Investment                        |
| SI       | System Integrator                           |
| SMB/SME  | Small & Medium Businesses (US / UK)         |
| UPC      | Universal Product Code                      |
| UPH      | Units Per Hour (may include 'Fully Loaded') |
| VAR      | Value Added Reseller                        |
| WCS      | Warehouse Control System                    |
| WES      | Warehouse Execution System                  |
| WMS      | Warehouse Management System                 |

