Mela Ventures

November 2025

The Next Frontier in Robotics:

From Motion to Orchestration



Executive Summary

Over the past five decades, industrial automation and robotics have progressed through **three major waves** - each expanding the scope of what machines can autonomously execute.

The first wave (1970s–2000s) centered on industrial robots performing high-precision, repetitive tasks, creating a $35B market but with rigid, point-solution deployments. The second wave (2000s–2010s) brought guided material-movement systems such as AGVs, improving throughput but requiring fixed infrastructure and limiting flexibility. The third wave (2015–2024) introduced flexible, infrastructure-free mobility powered by SLAM, LiDAR, and cloud connectivity accelerating adoption of Autonomous Mobile Robots (AMR) and building a **$5B+ market with 15–20% annual growth.**

Despite substantial progress, **scaling remains constrained** by fragmented hardware/software stacks, limited workflow intelligence, and the absence of unified orchestration systems. This has resulted in deployments that are difficult to integrate, slow to scale, and challenged in achieving predictable ROI.

Acquisition of point-solution robotics providers by major automation vendors (ABB, Rockwell, Zebra, Teradyne) demonstrates that **enterprises increasingly prefer full-stack automation solutions** over standalone hardware. As a result, these large vendors integrate multiple hardware systems into unified platforms capable of automating end-to-end workflows.

The next decade marks the emergence of the f**ourth wave: software-orchestrated robotics**, where intelligence, interoperability, and workflow automation become the core value drivers. Advances such as vision-language models, cross-embodiment learning, end-to-end robot learning, digital twins, and standards like ROS 2, SRCI, and VDA 5050 are enabling open, modular, mixed-fleet automation.

The market potential is significant. Autonomous Mobile Robots (AMR) penetration remains low - 8.2% in warehousing and ~5% in industrial environments. No player holds more than ~10% market share, and industrial AMRs remain largely underserved, creating white space for vertical-focused innovators.

Mela Ventures sees robotics at a major inflection point. With technology costs declining, labour shortages becoming more acute, a strong talent pool now available, and enterprises increasingly prioritizing automation, the sector is primed for scale. **Key success factors** for next-generation robotics companies include:

- Building consolidated, interoperable software architectures that unify motion, perception, data, and orchestration.
- Delivering modular, interoperable, safety embedded hardware that integrate seamlessly with existing shop-floor equipment.
- Focusing deeply on vertical workflows and integrating with MES, WMS, and ERP systems for end-to-end automation.
- Providing 24×7 observability, rapid service response, performance metrics, and sub-24-month ROI.
- Embracing Robotics-as-a-Service and SI/OEM partnerships to accelerate adoption and scale.

1 - A Brief History of Industrial Automation

Automation and robotics have evolved over five decades from mechanical precision to adaptive mobility. **Each technological wave has automated a deeper layer of industrial activity**, progressing from fixed motion control to flexible, facility-agnostic automation that can operate seamlessly within existing environments. There have been waves of automation that have shaped this journey:

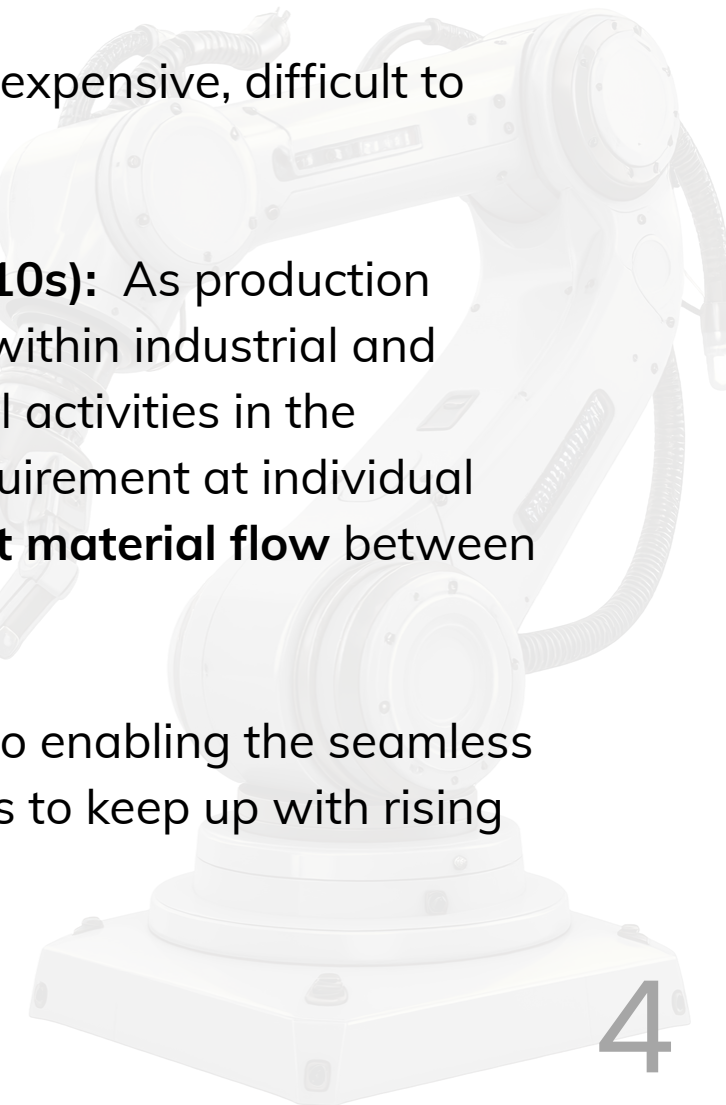
Wave 1: Industrial Automation (1970s–2000s): The automation story began in the factories of the late 20th century. Pioneering advances by large players such as ABB, FANUC, Yaskawa, KUKA, and Kawasaki in **mechanical precision and motion control systems** transformed manufacturing. These innovations introduced programmable systems capable of executing repetitive, high-accuracy operations, particularly in automotive and heavy manufacturing.

- This first wave created a $35 billion market, growing nearly 10% annually, driven by precision, uptime, and consistency.

- The trade-off was rigidity as these systems were expensive, difficult to reconfigure, and best suited for point solutions.

Wave 2: Automated Material Movement (2000s–2010s): As production scaled, the next major challenge became movement within industrial and logistics environments. The automation of mechanical activities in the previous wave significantly increased throughput requirement at individual stations, which in turn amplified the **need for efficient material flow** between them.

- The focus shifted from performing tasks in place to enabling the seamless movement of materials across production facilities to keep up with rising production speeds and volumes.



- Companies like Dematic, Egemin, and JBT responded with guided automation systems built around pre-defined paths and fixed infrastructure, improving throughput but limiting flexibility.

- To operate these systems required significant infrastructure modifications including magnetic tapes, floor markers, and fixed pathways to guide navigation.

- While this improved efficiency, the reliance on static routes made them suitable only for highly structured environments, and any workflow change demanded physical layout reconfiguration, constraining scalability and adaptability.

Wave 3: Flexible and Adaptable Automation (2015–2024): The third wave marked a fundamental shift in mobility and flexibility. Automation systems evolved from relying on fixed routes to **flexible movement within existing facilities**, eliminating the need for layout modifications or embedded guidance systems.

- Advances in underlying technologies such as SLAM (Simultaneous Localization and Mapping) and lidar-based navigation made it cost competitive for industrial adoption.

- This ability to operate without changes to the facility significantly reduced setup time and cost, leading to quicker ROI anticipation.

- Amazon’s acquisition of Kiva Systems in 2012 proved that mobile robots could scale, sparking an innovation wave. Players like Geek+, Locus Robotics, MiR, OTTO Motors, and Fetch Robotics expanded the space into a $5 billion market, growing 15–20% annually[1].

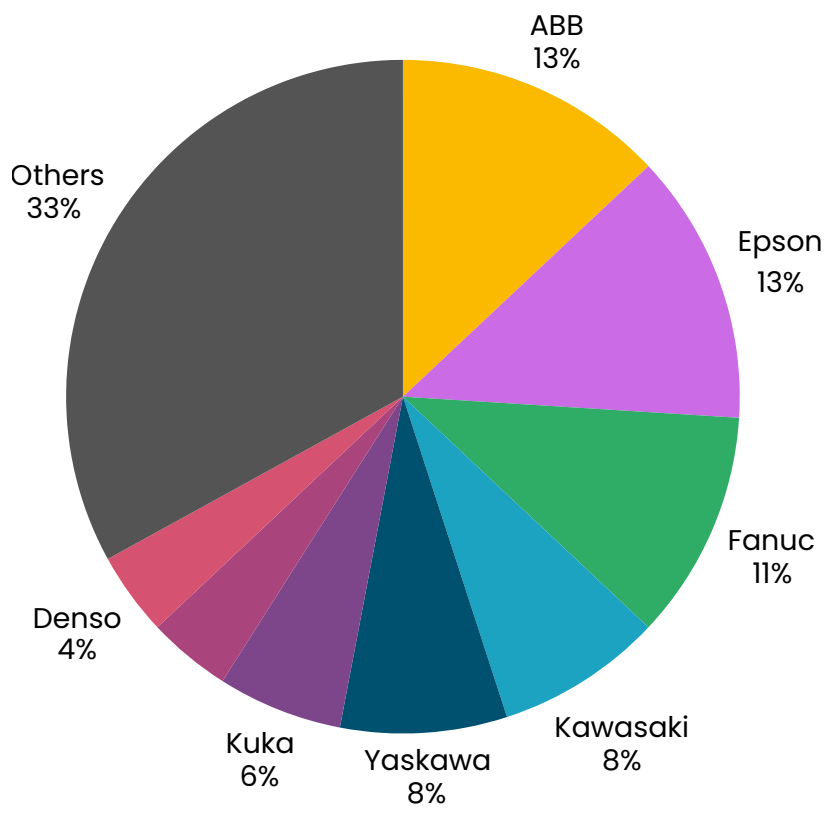
[1] ABB – Investor Presentation (2023), Geek+ research reports, Industry sources.

The Consolidation Wave: Scaling point solutions proved challenging. For instance, AMRs are needed to plug movement into the entire automation stack. **Enterprises were looking for vendors who can provide the entire automation stack.** Hence, partnering with vendors who could provide the full automation workflow; from AS/RS (Automated Storage and Retrieval Systems) , conveyors, machine automation to customized attachments led to faster scaling.

This approach led to a **wave of acquisitions** by large vendors who continue to dominate automation today. No new-generation player has crossed ~$500 million in revenue. Some of the key consolidations were -

- **ABB–ASTI (2021):** Combining motion and mobility into unified automation suites.
- **Rockwell–Clearpath/OTTO (2023):** Blending orchestration software with industrial systems.
- **Zebra–Fetch (2021):** Embedding mobile automation into broader automation portfolios.
- **Teradyne–Universal (2018):** Enabling modular, collaborative automation.

Market share of major players in global Automation/Robotics solution market in 2023[2]



[2] https://www.statista.com/chart/32239/global-market-share-of-industrial-robotics-companies/

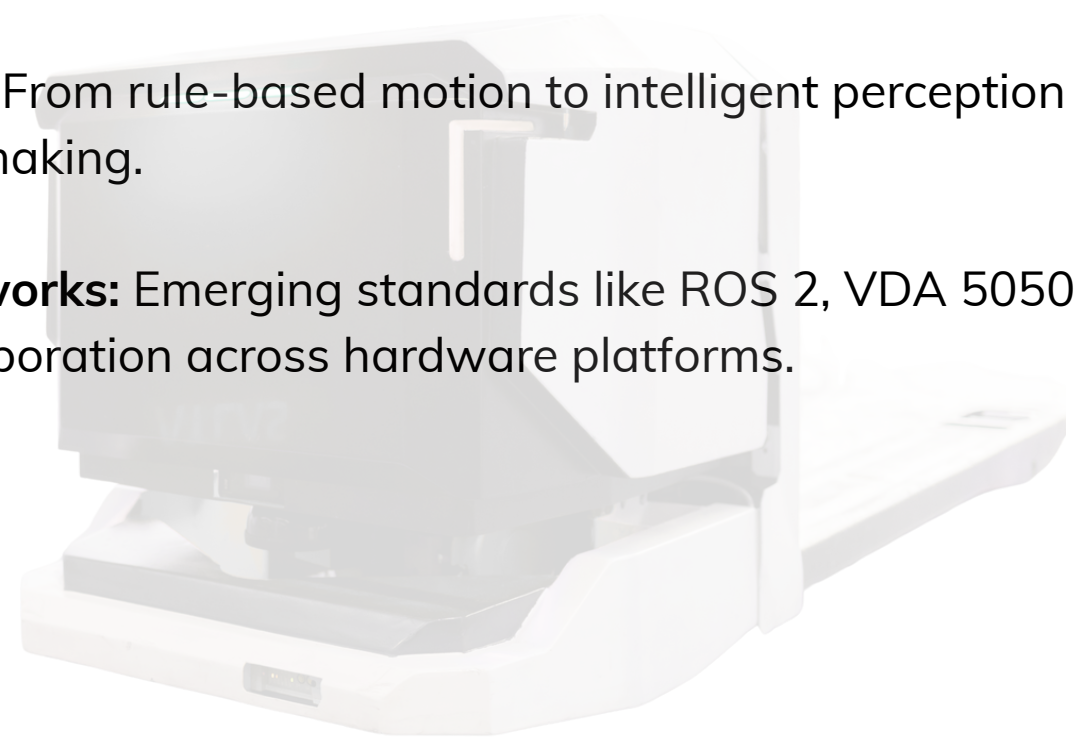
2 - Types of Robots across the Waves

- **Industrial Robots:** Fixed arms for welding, assembly, painting, and heavy-duty precision work.
- **Automated Guided Vehicles (AGVs):** Guided transport systems dependent on fixed navigation paths.
- **Autonomous Mobile Robots (AMRs):** Infrastructure-free, self-navigating robots for dynamic environments.

3 - Technology advances in Specific Robotic Areas

Each wave of robotics has been underpinned by critical advances in enabling technology.

- **Sensing & Perception:** Evolution of LiDAR, cameras, and multimodal sensors improving precision and navigation.
- **Localization & Mapping:** SLAM algorithms enabling autonomous navigation without fixed infrastructure.
- **Edge Compute & Cloud Connectivity:** Real-time processing and scalable orchestration for distributed robot fleets.
- **AI & Machine Learning:** From rule-based motion to intelligent perception and adaptive decision-making.
- **Interoperability Frameworks:** Emerging standards like ROS 2, VDA 5050, and SRCI enabling collaboration across hardware platforms.



4 - Struggles with Scaling

Despite significant advances over the last five decades across hardware, software, underlying technologies, certain challenges exist:

- **Fragmented Technology Stack:** Lack of standardized interfaces and proprietary ecosystems made cross-vendor integration complex.
- **Limited Workflow Intelligence:** Existing automation focused on motion and execution, not end-to-end decision-making or process optimization.
- **Absence of Unified Orchestration:** Automation systems operated in silos; hardware, data, and control layers lacked synchronization. This brings constraints on scalability as deployments never scale, uptime is compromised eventually leading to longer ROI.

All the above has led to challenges in widespread adoption of robotics across industries and process.

5 - What's Next?

Software-orchestrated robotics is emerging as the next big opportunity in the robotics space. The future will be defined not just by smarter machines but by the intelligence that connects and coordinates them.

- **AMRs are one application within this broader transformation:** They will continue to become smarter and more capable. We believe different hardware form factors will continue to emerge, but standalone innovation in hardware will not be enough to win the market or scale sustainably.

- **Orchestration will be of critical importance:** Success will depend on how effectively systems can unify hardware, data, and decision-making to deliver seamless, adaptive automation.

- The fourth wave represents the unification of robotics, where software becomes the central nervous system of automation, and building workflows and applications becomes faster, modular, and data-driven.

Several innovations are accelerating this shift:

- **Vision-Language Models** now allow robots to understand commands and scenes through multimodal reasoning.

- **Cross-Embodiment Learning** enables robots to transfer skills across different embodiments, improving data efficiency.

- **End-to-End Learning** bridges perception and low-level control, allowing robots to learn directly from experience.

- **Horizontal Platforms** including APIs, SDKs, and middleware are emerging to standardize development and unify fragmented robotics stacks.

6 - A Large Untapped Market Opportunity

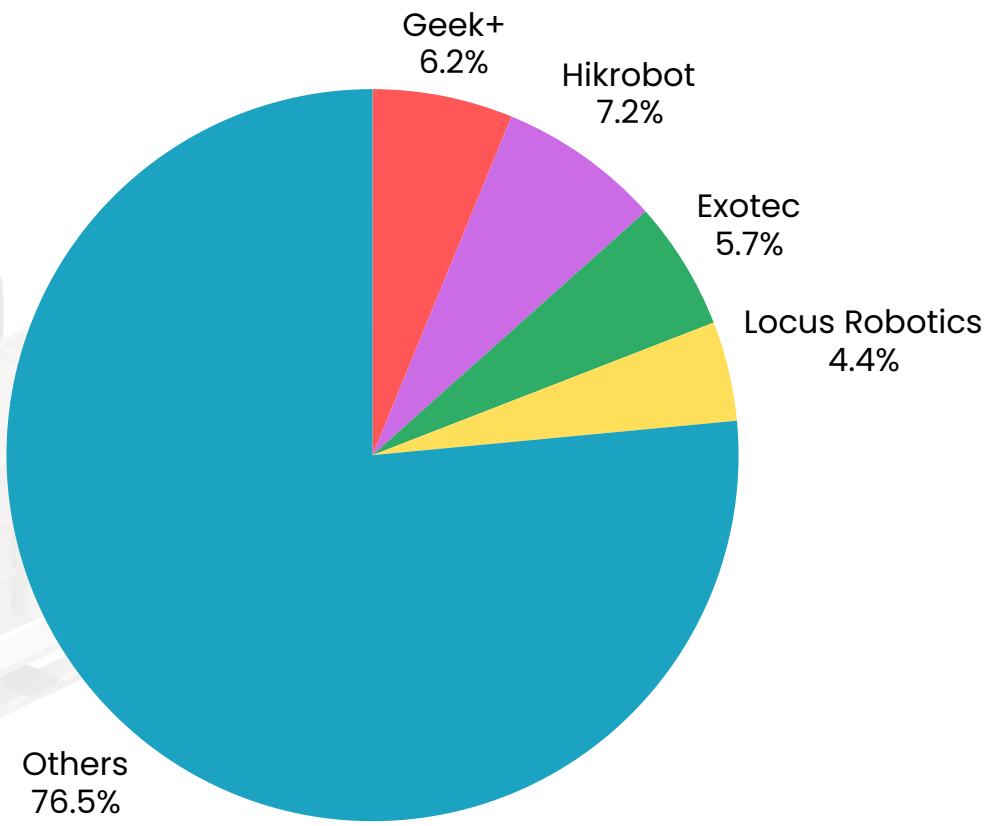
The AMR market is growing at a pace of 20%+ reaching $5 Bn. as of 2024.

- Warehousing automation has picked up momentum and automation penetration stands at ~22% in 2024. However, AMR penetration in the warehouse automation stands only at 8.2% in 2024 and in Industrial Automation is way lower at 5% (2023)[3].The penetration rate in warehousing has doubled from 2020-2024 and is expected to triple over next 4 years.

[3] Mobile Industrial Robots transcript - https://seekingalpha.com/article/4597334-teradyne-inc-ter-q1-2023-earnings-call-transcript

- No clear market leader in AMR space with significant share. All large players have less ~10% share[4].

Market share of major players in global AMR solution market in 2024[4]



7 - Why is Mela Ventures excited about Robotics?

- **A Sector on the Edge of Transformation:** Even after decades of automation, manufacturing robotics is still wide open. We are seeing traction and believe vertical focused robotics will gain momentum and scale.
    - Sectors such as construction, manufacturing, Cleaning, Pharmaceutical, education all represent large market opportunities. However, domain knowledge will be critical to success.

[4] https://hk-official.cmbi.info/upload/2d076bc0-ab6c-449d-984a-7a79ce3ef450.pdf

- **Massive market whitespace:** With penetration below 5%, industrial robotics is a multi-billion-dollar opportunity.

    - **No company holds dominance**, leaving space for vertical specialists who can fix core pain points like interoperability, integration, and ROI.
    - Specifically for manufacturing, global penetration remains below 5%, which means most production lines still rely on manual labour.
    - **Few companies focus purely on industrial AMR** (Autonomous Mobile Robots).
        - The largest, Geek+, has roughly 6% market share with $300M+ in revenue, mostly from warehousing.
        - MiR, focused on industrial automation, has just 1–2% share and $72M in FY24 revenues.

- But the **landscape is now at an inflection point.** The ingredients that held robotics back - cost, complexity, and adoption barriers are finally being replaced by three major tailwinds:

    - **Mature technology at large scale:** Advances in sensors, edge compute, AI, and digital twins have dramatically reduced the cost and complexity of robotics. What once required custom infrastructure is now plug-and-play.
    - **Business urgency is real:** Manufacturers face rising costs and shrinking workforces. Labor shortages are real. Automation has shifted from optional efficiency to essential survival.
    - **Available Talent Pool:** Engineers from EVs, semiconductors, and AI are moving into robotics. Tooling is better, simulation has simplified design, and compensation now matches top tech sectors, fueling a deep, capable talent base.

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8 - What are we looking for in the Next Generation of Robotics Solutions?

- **Consolidated and Interoperable Software Architecture:** Unified orchestration, learning, training, and operator interfaces must be simple, integrated, and data-driven. Software will define how robots collaborate, learn, and adapt in real time. The software should be able to make the hardware (AMR, robotic arms etc.) work with any equipment on the manufacturing shop floor with APIs rather than custom coding.

- **Complex Engineering Done Simply:** Interoperability, Modularity, Safety: Future systems must be open and modular, integrating hardware and software from multiple vendors seamlessly. Standards like ROS 2, SRCI, and interoperability frameworks such as VDA 5050 and MAA are enabling safe, flexible deployments across mixed fleets. Digital twin simulations enhance configurability and testing. Safety frameworks embedded in planning and control layers are a core differentiator w.r.t deployment alongside humans.

- **Vertical Focus and Workflow Integration:** Generic robots often fail to prove ROI. Success lies with vertical specialists who map tightly to domain workflows. Deep integration with MES, WMS, and ERP systems turns automation into end-to-end digital transformation. Co-designing with customers in specific verticals may accelerate product-market fit.

- **24×7 Support, Observability, and Quick Turnaround:** Enterprise buyers equate uptime with trust. Continuous observability and proactive support are must-haves. We value platforms offering:
  - Continuous remote monitoring & diagnostics
  - Quicker turnaround in case of failure
  - We believe that high-quality, reliable support is at least as important as the robot, if not more.

- **Visible ROI and Uptime Metrics:** Enterprises now expect transparent performance data - cycle times, throughput, utilization, MTBF, wait times. Robotics providers that offer real-time dashboards comparing robotic vs. manual performance build trust and faster adoption. Sub-24-month ROI is now the benchmark.

- **Business Model Innovation - Robotics-as-a-Service (RaaS):** The shift from Capex to RaaS is reshaping adoption. By bundling hardware, software, maintenance, and updates into subscription or pay-per-use models, providers align directly with customer outcomes.

- **Go-to-Market via OEMs and System Integrators (SIs):** Industrial buyers prefer turnkey solutions. Partnering with large SIs accelerates credibility and shortens sales cycles - enabling AMRs to integrate within larger automation suites. Though partnerships take time, they unlock rapid, scalable rollouts once validated.

Mela Ventures believes industrial robotics is entering its **'software moment'**; open architectures, modular stacks, service-based models, and vertical workflows will transform manufacturing floors.

We will back founders who:

- Building a platform play, rather than product play. Platforms offer room to provide multiple solutions and expand within the customer.

- Treat engineering depth as competitive advantage but build open, interoperable systems.

- Obsess over customer ROI, uptime, and support experience.

- Innovate on business model as much as on technology.

- Build for specific verticals first, scale horizontally later.

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About Us

Mela Ventures is an operator-led, early-stage Venture Capital firm. We back B2B technology founders solving globally relevant problems across three broad sectors - EnterpriseTech, DeepTech, and ClimateTech. Mela Ventures enable success beyond funding through strategic and operational insights, access to proprietary networks, and technical guidance for scalability.



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