GUIDE

The warehouse automation equation: how to choose the right mobile automation supplier

Yale®
LIFT TRUCK TECHNOLOGIES

The pressure to move goods faster, safer and more efficiently in warehousing environments has never been greater. Supply chains are overextended across global networks, customer expectations are mounting and labor availability continues to erode. As a result, materials handling operations are increasingly adopting automated lift trucks not as a luxury — but as a strategic necessity.

Though lift truck automation is still an emerging technology, the supplier landscape and viable solutions are quickly expanding. Operations can choose from a variety of supplier types, each with its own set of pros and cons. This guide discusses the key factors to help you decide which one is right for your operation.

Choosing the right automated lift truck provider type involves understanding the tradeoffs that come with each. Evaluating suppliers through the lenses of cost, complexity, reliability and risk provides a practical framework for comparing each approach.

MOBILE WAREHOUSE AUTOMATION SUPPLIER LANDSCAPE

LIFT TRUCK OEMs	AUTONOMOUS MOBILE ROBOT PROVIDERS
Forklifts with automation developed by the original equipment manufacturer (OEM), a company that can also offer manual lift trucks. Generally considered the most dependable option due to extensive service networks, but some OEMs may be slower to innovate and offer fewer customization options.	Autonomous pallet movers, available with and without forks, with hardware and automation developed by robotics companies, startups or system integrators. Typically a cheaper upfront option, but often with low maximum load capacities and limited support networks.
AUTOMATION COMPANIES PARTNERING WITH LIFT TRUCK OEMs	**PURPOSE-BUILT AUTOMATION COMPANIES**
Forklifts provided by a lift truck OEM and outfitted with automation developed by a robotics firm. Familiar hardware, but two separate business entities collaborating leaves potential for cumbersome solutions and support processes.	Custom powered industrial trucks manufactured by a robotics company to house their automation. Provides maximum specialization, but at the highest cost and with minimal flexibility.

Cost

The most significant barrier to automating is typically cost. Depending on the supplier you choose, your upfront capital outlay can be anywhere from insignificant to exorbitant. Each project varies based on scale and the degree of customization, however automation by lift truck OEMs and autonomous mobile robot (AMR) providers can typically get operations started for less than automation from a robotics firm, whether installed on a purpose-built or standard lift truck chassis, which tends to be more expensive going in.

In each case, ongoing costs will surface over time, potentially changing the economics of an automation investment. The total cost of ownership hinges on factors such as service or dealer network strength, parts availability and how complex it is to modify automation workflows as your operation evolves.

Different suppliers enable varying levels of financial adaptability, as well — think of the flexibility to trial automation at a low cost, without committing to a minimum rental or lease period or number of trucks, and with the ability to return the solution if you are not satisfied. Likewise, the opportunity to spread costs out over time or maximize financial flexibility through month-to-month agreements.

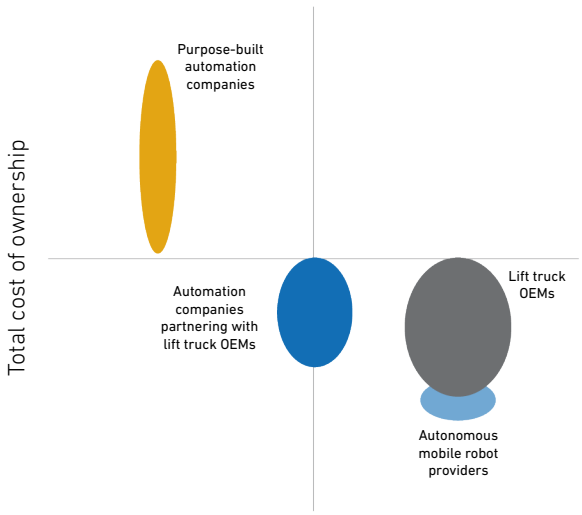
Purpose-built automation companies: This is typically the most expensive path. These custom-engineered vehicles can only be purchased or leased, not rented. Because they are purpose-built, suppliers are not taking them back once deployed, which locks you into a longer-term commitment.

Automation companies partnering with lift truck OEMs: Here, automation is added onto a conventional forklift platform from an OEM. While generally more affordable than a fully custom chassis, these units also lean toward purchase, robots as a service (RaaS) or lease models, with limited rental flexibility. The total cost of ownership for these units can also be higher than some alternatives because two companies must be able to achieve sufficiently attractive margins from the solution.

Lift truck OEMs: Most OEMs currently offer automation through traditional lease or purchase agreements. Only a few offer rental programs, allowing operations to deploy trucks quickly and gather performance data without committing to a longer-term arrangement. Unlike a true RaaS model, rentals are priced by how much equipment is deployed rather than output, such as moves, cases or eaches.

Autonomous mobile robot providers: AMR suppliers typically offer flexible commercial models. Customers can rent, lease or purchase units, and many providers also offer true RaaS programs, with billing tied directly to throughput or utilization. This makes AMRs well-suited to operations with variable demand, where businesses may need to scale quickly by adding or removing units.

Cost considerations[1]



[1]Relative placement and size of supplier type markers are approximate. All matrices included in this document are based on anecdotal evidence.

Service and reliability

When it comes to reliability and service support, OEM lift truck manufacturers stand out. They not only design, build and warranty their own vehicles but also back them with established service networks, trained technicians and readily available parts. That scale and infrastructure translate to faster repairs, predictable maintenance and a higher level of long-term dependability.

The other supplier types tend to operate on service tiers that are similar to one another, but lower than those of automation from forklift OEMs. Each has its own challenges:

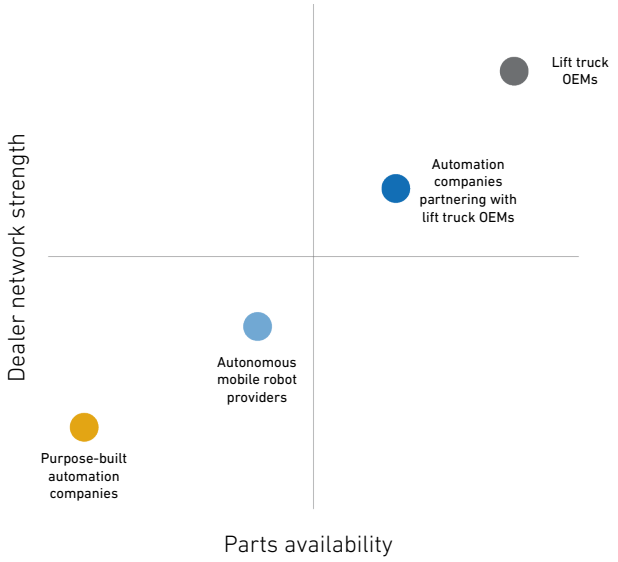
Purpose-built automation companies: Custom-built vehicles can be challenging to support due to long lead times for specialized parts, and technicians' limited familiarity with bespoke solutions engineered specifically for your operation. As such, their warranties are often subject to strict terms, similar to those for automation on a manual forklift chassis.

Autonomous mobile robot providers: AMRs are smaller and often easier to swap out, but still too costly to discard over minor issues. With informal or limited service arrangements and without a dealer-backed support model, parts and maintenance costs can become hidden expenses that only reveal themselves once the system is already deployed.

Automation companies partnering with lift truck OEMs: Standard chassis integrations may require coordinating between multiple providers for service. Even with a robust dealer network, a forklift OEM's technicians may only be trained on automation hardware, leaving users responsible for training internal staff, finding local support or bringing in a specialist from the automation provider to consult on automated components or troubleshoot the technology.

Lift truck OEMs: With well-defined dealer networks to rely on and both key components — the chassis and automation technology — engineered in-house, automation by lift truck OEMs represents the lowest risk in terms of parts and labor availability. Warranties are typically also strong, supported by the large install base of non-automated lift trucks that allows OEMs to confidently stand by their product.

Service & reliability considerations



Complexity

Automated lift truck solutions vary in complexity, with some supplier types offering quick, scalable implementation and others offering a high degree of customization at the expense of time and perhaps the solution's flexibility.

Do operators, supervisors and techs already have experience with a manual version of the equipment? Will training or employee onboarding be an extensive and expensive endeavor? Will the automation play nicely with existing software, and will it be easy to modify automated workflows over time, or will it require costly software engineering each time your needs evolve?

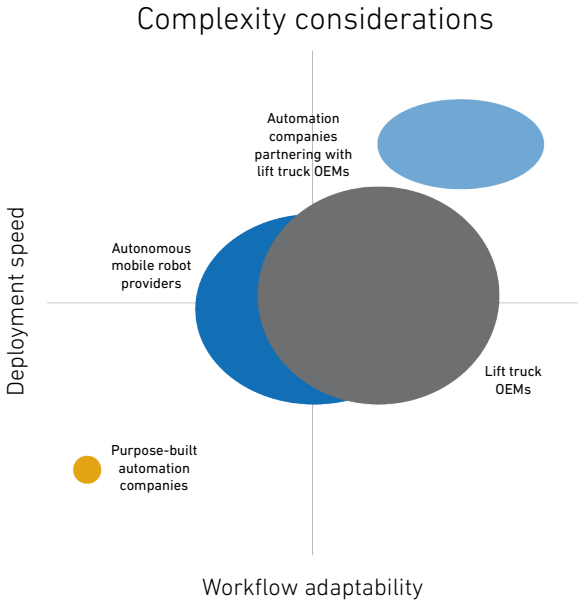
While the speed and complexity of setup depend on the project's scope, whether the supplier has prebuilt inventory, and what infrastructure you'd need to install in your facility, general planning, implementation and ongoing use considerations are below.

Purpose-built automation companies: These solutions are highly tailored and niche, with less efficient manufacturing processes. These projects typically take longer to deliver and require significant time and labor to modify processes or add vehicles.

Automation companies partnering with lift truck OEMs: Working with a known lift truck provider provides some inertia during implementation. But incorporating a third-party automation solution means managing relationships with multiple vendors, which can complicate accountability and clear ownership of outcomes, as well as the risk of long-term compatibility issues between the hardware and software.

Lift truck OEMs: Forklift manufacturers bring scale advantages, including larger workforces, pre-built inventory and direct access to the truck itself, often resulting in shorter lead times. However, the ease and speed of deployment and changes can vary. Inquire about the automation's managing software, including whether it requires coding expertise or is designed for use by someone other than a software engineer.

Autonomous mobile robot providers: AMRs typically offer simple setup instead of complex coding or engineering. However, there can sometimes be hidden complexity in the form of infrastructure changes required to integrate AMRs into their intended workflows. For example, operations using AMRs to transport single pallets horizontally may need to add pallet stands to their facility or modify racking to appropriate heights so robots can properly engage with pallets.



Risk validation

Risk varies widely across mobile automation suppliers, and the difference often comes down to proven experience. The reality is that the number of documented installs is highly variable among players within each of the four supplier categories, so it is important that customers ask prospective providers a simple question: Have you done this before? Suppliers with a large install base, repeatable build processes and documented customer outcomes present far less risk than newer entrants still proving their technology in the field. Many smaller automation startups enter the market with capable concepts but limited application experience, overpromise to satisfy investors, and struggle during deployment, leaving customers frustrated and wary of future automation investments.

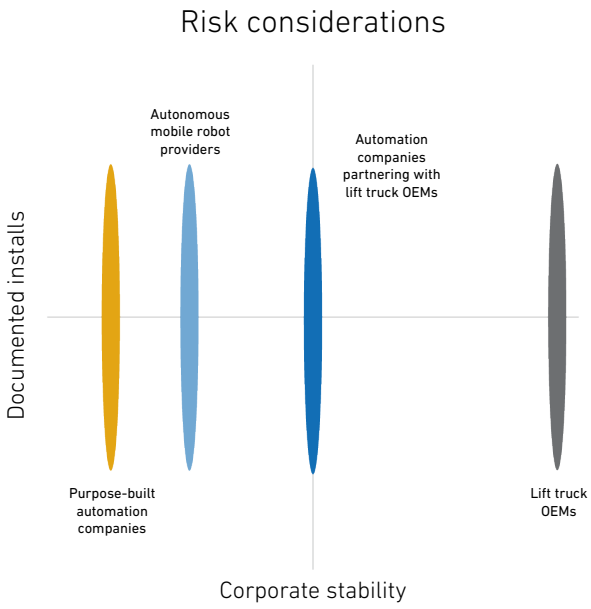
Beyond installation experience, risk is shaped by financial stability, scalability and long-term support:

Purpose-built automation companies: These solutions generally represent the highest risk, as they are often slow-to-produce, one-off projects that are difficult to scale, modify or replicate. Additional risk stems from low corporate stability: While securing a single large deal can financially sustain a purpose-built automation company for a year or so, they sometimes lack the diversified customer base to protect against the risk of closure during demand dry spells, leaving customers without parts or service for their substantial investments.

Autonomous mobile robot providers: Some AMR providers can deliver exciting, innovative solutions, but because many are newer and rapidly evolving, they also may carry added risk in terms of long-term stability and financial depth. As with purpose-built automation companies, this raises concerns about parts availability and service continuity. However, if the company goes under, the lower cost of the AMR solution means the loss of support is typically less financially devastating than for a large investment in a now-defunct purpose-built solution.

Automation companies partnering with lift truck OEMs: Solutions built on a standard base chassis fall somewhere in the middle, offering more stability than AMRs but introducing uncertainty through multi-vendor relationships and the potential volatility of the automation supplier.

Lift truck OEMs: Lift truck manufacturers typically carry the lowest risk, backed by large installed fleets, proven models, robust parts inventories and dealer networks, and long-term company viability. Suppliers that offer rental programs may further reduce the burden of risk to customers by enabling operations to pilot automation in their own facilities at a low cost.



Making the mobile warehouse automation supplier decision

Choosing the right automation supplier is ultimately about fit, not hype. The most successful deployments align technology with operational realities — balancing upfront investment against long-term cost, flexibility against complexity, and innovation against proven reliability. While every operation has unique demands, the fundamentals remain the same: competitive cost structures protect margins, proven installs reduce risk, strong service networks protect uptime, and scalable solutions preserve options as your business evolves.

By weighing these factors carefully, warehousing and supply chain leaders can move beyond experimentation and invest in automation that delivers durable value.

To explore how Yale approaches automated lift truck solutions, visit Yale.com.

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