



TRENDS IN SUPPORTING AND SCALING MODERN AUTOMATION

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EXECUTIVE SUMMARY

The year 2020 was a turning point for many industries and markets. The slow but steady growth of the previous decade has given way to an economic downturn as the threat of COVID-19 forced the global economy into a recession. In contrast, the crisis is stimulating the adoption of new technologies that were not expected to be implemented for several years. For example, despite the tumultuous economy, the pandemic has fueled interest and investment in automation. Airports and hospitals have brought in disinfection robots. E-commerce retailers have doubled down on automation in stores and across warehouses to facilitate the increased demand for online shopping deliveries. Since the early stages of the pandemic, the industry has been busy testing a number of robotics solutions, from last-mile delivery to drones being used to enforce curfews.

However, increased demand also presents challenges to supply, as difficulties related to scaling automation threaten to hamper the market's true potential. These difficulties are part of the post-sale lifecycle of automation systems, best described as **Service Lifecycle Management (SLM)**. This term entails pre-sale consulting, installation, employee training, operations, customer service, and end of life reclamation.

As enthusiasm for automation grows across multiple industries, can automation providers implement effective service and support to cope with demand? Challenges abound throughout the lifecycle of automation solutions, such as design and evaluation, installation, ongoing maintenance, training, and customer service. Automation vendors may find it difficult to conduct a full SLM plan on their own, so there is a growing demand for third-party service providers that can assist in scaling. Only via this collaboration can automation vendors meet their potential.

To summarize, an increase in demand for automation presents a capacity challenge for automation vendors, which struggle to scale effectively on their own and execute effective SLM programs. To cope with these demands, collaboration with a growing market of third-party service providers is key for automation vendors. These third parties, often system integrators that have taken on new responsibilities, are becoming a more important part to the automation value chain and its entire ecosystem.

This report bases its analysis on interviews conducted with business leaders providing modern automation, robotics, and Artificial Intelligence (AI) solutions.





THE VALUE OF MODERN AUTOMATION

In the broadest sense, automation is the process of doing more with less manual intervention, more efficiently and consistently. In an age of uncertainty, increasingly complex supply chains, labor shortages, and demographic aging, the drive to automate processes takes on greater importance.

For much of this millennium, manufacturers had hoped to mitigate supply chain challenges and operating costs by offshoring manufacturing operations to lower-wage regions, particularly China. This situation is increasingly untenable. For one, labor wages in China and other developing countries are increasing, and trade uncertainty has thrown the economic rationale of offshoring into question. The impact of COVID-19 on highly interdependent supply chains has only reinforced this point. There is a growing consensus among policymakers and business leaders to return at least some production to local high-wage jurisdictions.

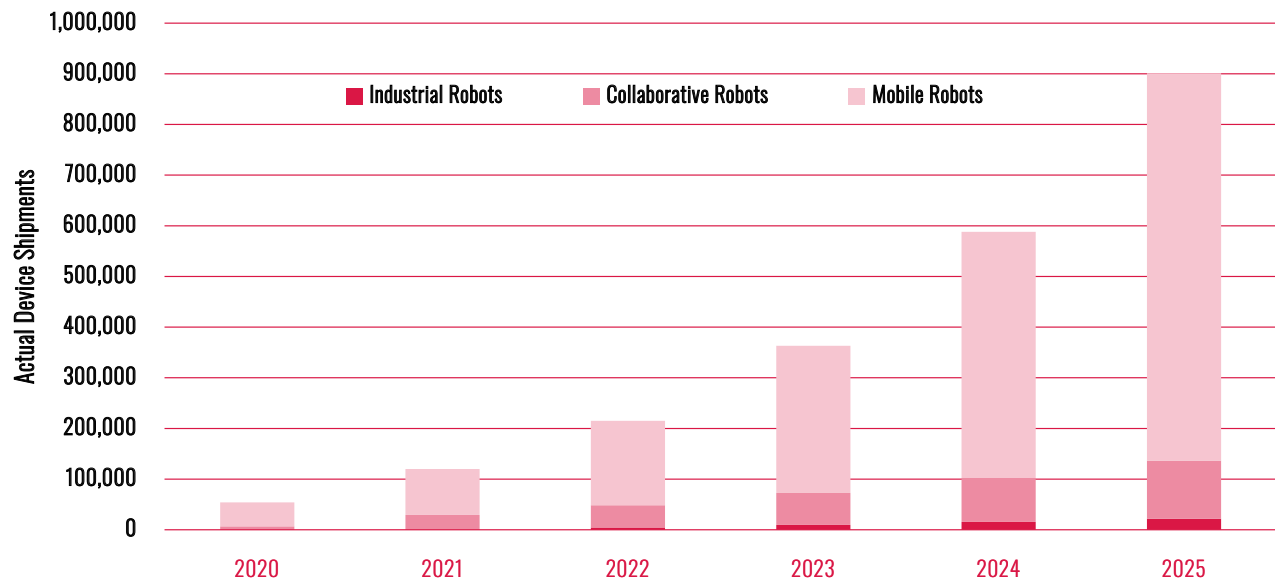
But this push to reshore production in crucial areas is far from guaranteed and will even be impossible without automation. In order to mitigate labor costs and modernize manufacturing and supply chain processes, end users need to invest in automation like never before. A particular segment of the supply chain in need of automation is material handling. Currently, the movement of goods within warehouses, distribution centers, and factories requires significant labor from manual workers and (traditionally) worker-operated vehicles like forklifts and pallet stackers. In the United States, during 2019, the Bureau of Labor and Statistics recorded 95,860 industrial truck and tractor operators and 301,210 laborers and material movers for the warehousing and storage sector. What is more, employment demand is growing, as evidenced by Amazon hiring 100,000 new employees to cope with increased demand due to the pandemic.

As the labor market tightens due to aging populations, supplementing and augmenting this labor force will be critical. Luckily, automation solutions have never been more available. Advances in sensors, computing, and AI have made automation a much stronger business prospect for organizations. Through new processes like advanced machine vision, Simultaneous Localization and Mapping (SLAM), advanced telecommunications technologies, Natural Language Processing (NLP), and

open-source tools like Robotic Operating System (ROS), today's collaborative robots (cobots) and mobile robots are of an order of magnitude more advanced than the first traditional industrial robots seen in factories during the 1960s. This development is reflected in Chart 1, which shows the demand for on-device AI edge chipsets deployed in robotics increasing from 57,000 shipments in 2019 to 901,000 in 2025. The robots are not merely more numerous, they are becoming smarter.

Chart 1: Total Shipments of Robots with Edge AI Chipsets World Markets: 2020 to 2025

(Source: ABI Research)



ABI Research expects to see many cobots and mobile robots deployed throughout the supply chain, either upstream at manufacturing establishments or downstream in fulfillment centers and even in retail stores. The modern automation ecosystem runs on a spectrum of solutions ranging from “pipeline-style” fixed infrastructure like conveyance to more flexible navigation offerings using Autonomous Mobile Robots (AMRs). These respective approaches have advantages and

disadvantages based on the end user's need. Predictable and high-volume fulfillment scenarios call for fixed conveyance. For less predictable material handling workflows, the flexibility and reconfigurability of AMRs are highly preferred. Moving forward, as the demand for adaptability and flexibility increases in the ever-evolving supply chain, there is an inevitable drift in value toward AMRs as key enablers for automated material handling in the future.

COVID-19 AS A CATALYST FOR AUTOMATION

Across the world, COVID-19 has taken its toll, and the automation industry, like many other sectors, has been affected. While interest in automation is up, actual deployments of automation solutions have dipped globally, pushing some automation vendors to cut staff in wide-sweeping redundancies. There have been deployment difficulties due to lockdowns, while teams in manufacturing and distribution have been required to enact social distancing measures that disrupt the process of installing automation equipment.

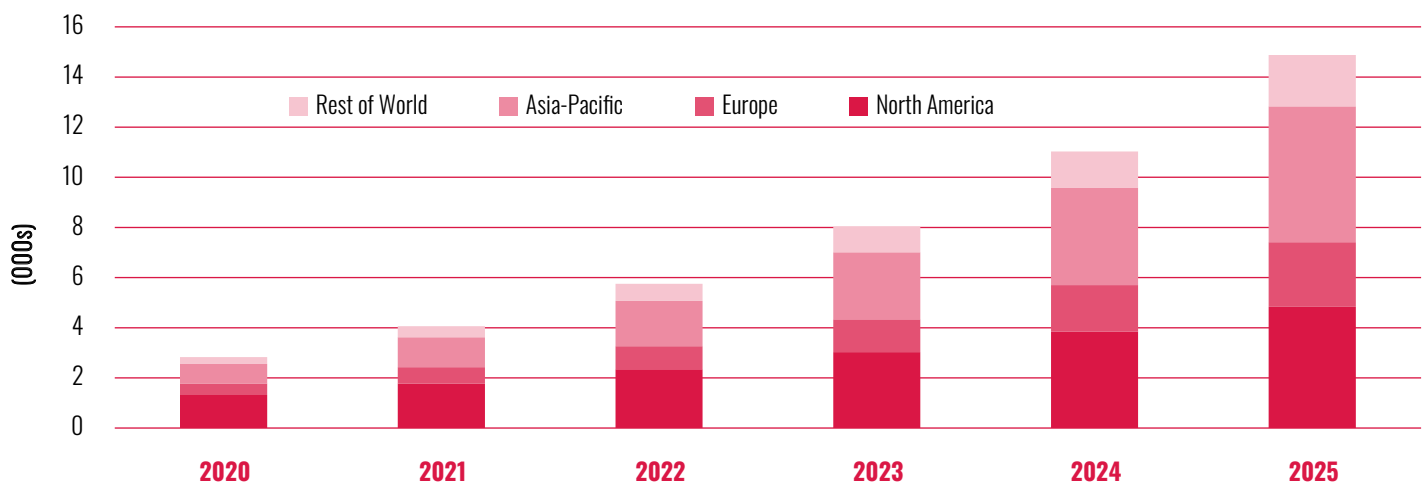
However, the lockdown enforcement resulting from the pandemic's spread has restricted the availability of workforces and pushed many industries to adopt automation to ensure business continuity. For example, in high-traffic public spaces like airports and healthcare facilities, the need for improved cleaning solutions led to widespread rollouts and adoption of autonomous disinfection solutions, with thousands being ordered earlier in the year. The use of automated scrubbers became increasingly commonplace, as retailers and airports struggled to maintain consistent cleaning labor. The recent vaccine advancements and the prospect of normality will further encourage end users to invest, so while the virus temporarily constrains the industry, it will likely not lead to any lasting decline in demand.

At the same time, the financial market appears undeterred, with more than US\$20 billion of corporate and Venture Capital (VC) funding in automation for 2020. This financial investment in automation startups validates the stable health of the industry and will ensure that any slowdown from 2020 is mitigated by a strong rebound in 2021.

The crisis even acted as an accelerator for investment. One of the pandemic's key challenges for automation players has been meeting excess demand, particularly earlier in the year. E-commerce demand boomed, leading major logistics vendors to increase their automation investment. E-tailers found that the throughput usually seen during Black Friday and the later holiday season became the standard throughout the year. The pandemic accelerated a consumer migration to e-commerce, and many will not revert to their old habits. According to ShipMatrix, a shipment data tracking company, more than 3 billion packages were shipped in the United States between Thanksgiving and Christmas in 2020, up 36% from 2.2 billion in 2019. In turn, the consumer uptick accelerated the degree to which supply chain stakeholders plan to deploy automation. ABI Research forecasts that there will be 14,879 highly automated warehouses globally in 2025, as opposed to the 2,830 in 2020. All of this growth is dependent on the ability of automation companies to scale. Still, the challenges of scaling automation solutions remain immensely challenging for vendors that provide and service automation equipment.

**Chart 2: Automated Warehouses by Region
World Markets: 2020 to 2025**

(Source: ABI Research)



AUTONOMOUS FORKLIFTS AND THE ENORMOUS POTENTIAL FOR AUTOMATION

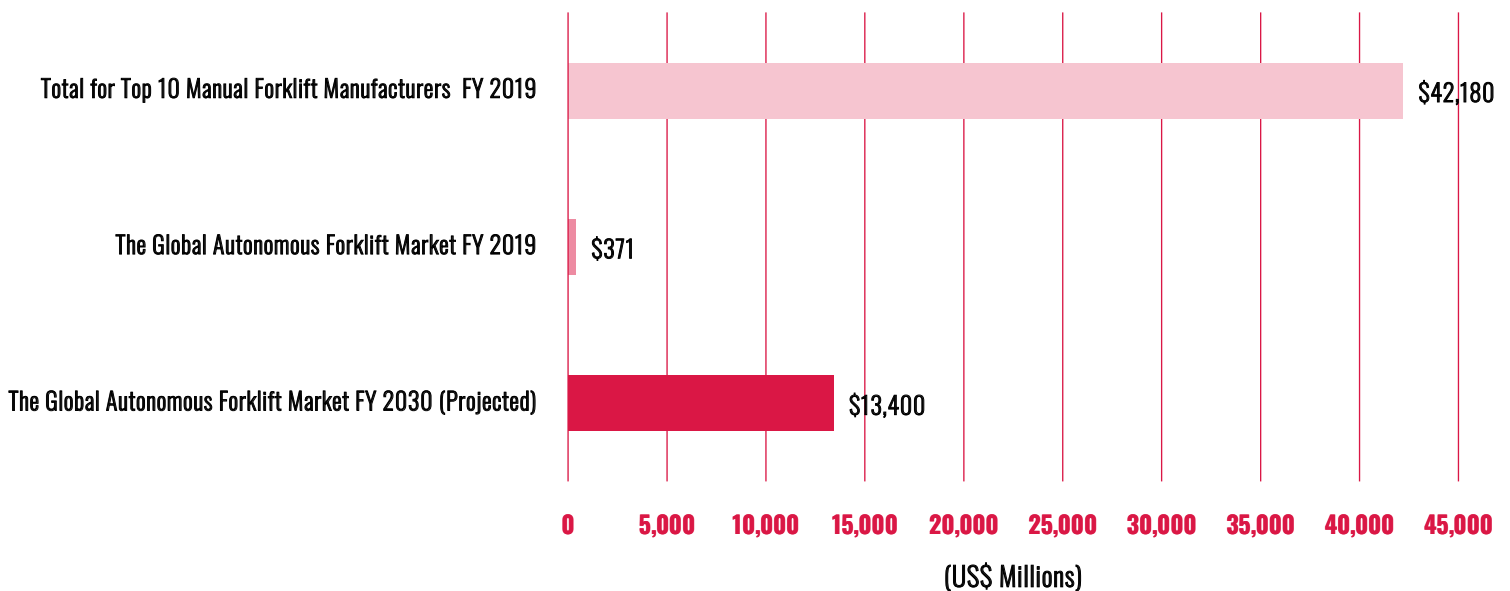
The current enthusiasm regarding technologies like mobile robots is only just beginning. This is particularly the case for autonomous forklifts used for material handling and transporting pallets. These solutions are currently gaining newfound traction due to their high payloads, lift capability, and flexibility. They are represented by companies like Balyo, Seegrid, Vecna Robotics, and AGILOX.

While these companies are beginning to achieve tangible success with thousands of shipments, we are just scratching the surface of the full potential of autonomous forklifts. The room for scaling these solutions is huge as forklift vendors have only begun to introduce automation to their fleets. According to ABI Research's analysis, the top 10

material handling manufacturers shipped 883,000 units in 2019 (including forklifts, pallet stackers, tow trucks, and tuggers) with a market value of US\$42 billion. In the same year, 6,000 mobile autonomous forklifts were sold with annual revenue of US\$371 million. Currently, less than 1% of material handling vehicles shipped every year are automated. This means there is a Total Addressable Market (TAM) worth billions of dollars if automation companies can effectively scale their offerings. Chart 3 showcases this potential, with the global autonomous forklift market growing by 3,511% between 2019 and 2030 to reach US\$13.4 billion in value representing 33% of the TAM. As of now, the forces restricting the autonomous forklift market are on the supply side, with particular emphasis on additional maintenance costs, autonomy exceptions, integrating with Information Technology (IT)/Operational Technology (OT) infrastructure and employee training.

Chart 3: Total Revenue of Global Autonomous Forklift Market World Markets: 2019 and 2030

(Source: ABI Research)

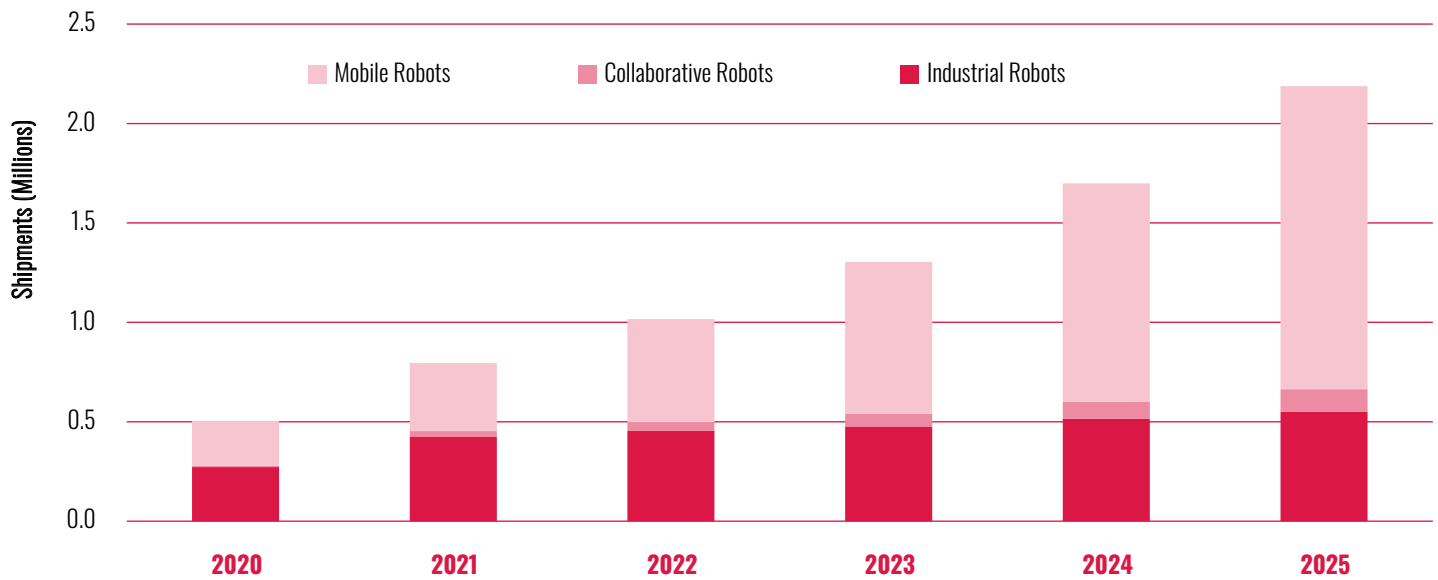


Currently, autonomous forklifts are a particularly attractive market, but the broader opportunity applies to automation and robotics more generally. More than 6 million commercial robots will be shipped in 2030, and the industry will increase revenue

from US\$22 billion in 2020 to US\$91 billion by 2025. The diversified revenue stretches across a range of robot categories with Chart 4 highlighting annual shipments increasing from 505,000 in 2020 to 2.18 million in 2025.

**Chart 4: Total Shipments of Industrial and Commercial Robots
World Market, Forecast: 2020 to 2025**

(Source: ABI Research)



As this growth occurs, the parallel development of mobile robots and cobots will lead to the introduction of even more advanced mobile solutions that can manipulate their environment.

AUTOMATION VENDORS LEAVE THE STARTUP PHASE AND SPECIALIZE

After decades of research and pilot-testing, the automation and robotics industry has moved out of its formative phase. Essential technology innovations around perception, navigation, and manipulation have demonstrated their effectiveness. Now, with scaling in mind, the emphasis is moving from individual robots, vehicles, and products to systems and solutions targeting the wider value chain of automation. As the value of automation has been proven, the focus of vendors is shifting from disruptive technology developments to improving both the product and the service.

As befits the complexity of the technology, automation and robotics vendors are incredibly varied in their offerings. While a small number are looking to move up the value chain and develop improved operational services, most new vendors are focused on product development for well-defined applications. Some are specialized technology vendors that are not even manufacturing or selling robots, instead offering a technology

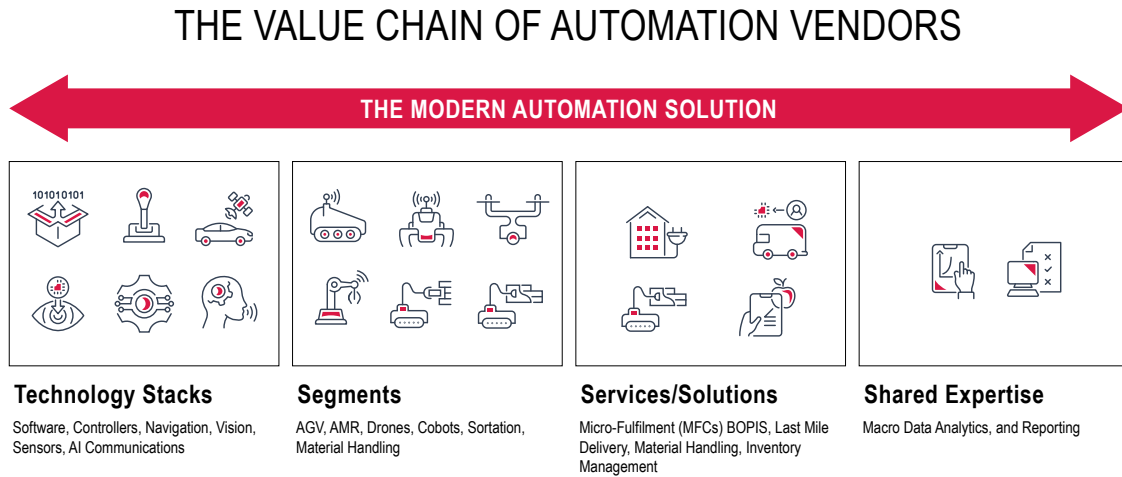
stack integrated by Original Equipment Manufacturers (OEMs). These partners may be other robotics companies or specialty equipment manufacturers for products such as forklifts and cleaning equipment. As examples, foundational technology vendors like Brain Corp and BlueBotics focus on consultancy projects and building automation solutions for companies that then sell into the automated equipment market.

As can be seen in Figure 1, the modern automation solution consists of multiple sectors in which knowledge and expertise are very specialized. While vendors may specialize in market segments or may offer additional services, there are very few modern automation vendors that can provide comprehensive coverage for the entire value chain.



Figure 1: The Value Chain of Automation Vendors

(Source: ABI Research)



This built-in complexity and segmentation make it very difficult to scale automation, and especially for vendors looking to provide effective SLM on their own.

MORE DEMAND BRINGS MAJOR CHALLENGES

As alluded to earlier, COVID-19 has been an accelerant for automation. The market potential for automation is huge and automation vendors are increasingly finding their place in the value chain.

But at this stage, demand for automation has outstripped the capacity of vendors to scale quickly enough, while maintaining quality control for lifecycle management functions. Deploying automation is complex, and inefficiencies brought about by post-sale costs and equipment service and support are the single biggest inhibitor to adoption.

Currently, automation solutions are deployed as a patchwork of different solutions loosely agglomerated into an informal system. A large manufacturer may need to interact with dozens of vendors for the various technologies and devices, such as articulated robotic arms, Delta and SCARA systems, gantry robots, and AMRs for tugging, towing, and lifting. They use a variety of internal and external sensors, and a wide range of computing systems and software applications related to data collection, communications, fleet management, and machine vision. These components are often sourced from a variety of vendors with no interoperability programs in place. Then, there is the challenge of integrating with the local Warehouse

Management Systems (WMSs) or Enterprise Resource Planning (ERP) systems, which may present complexities. The lack of a unifying architecture makes the challenge of incorporating automation prohibitive to all but the most well-resourced organizations.

To summarize, automation is very hard to scale, and especially for one vendor. However, this challenge is fueling demand for third parties that can connect these highly complex ecosystems and turn them into turnkey solutions that increase productivity and boost scale in line with market demand. These third parties, often system integrators, will be increasingly influential as automation vendors are forced to scale their lifecycle support.

THE CHALLENGES OF SERVICE LIFECYCLE MANAGEMENT

As the automation industry matures, onlookers are wondering what the ecosystem will look like looking forward. Some initially thought that automation vendors focused on a robotic technology stack could achieve the platform-centric dominance that digital companies like Google and Amazon have achieved in the cloud market. But the ability of digital enterprises to scale rapidly does not translate easily to hardware-centric automation and robotics applications. When it comes to platformization and economies of scale, there are no parallel analogies between the automation and robotics industry and cloud or IT industries where companies like Microsoft, Amazon, and Google have managed to horizontalize their offerings across multiple

industries. This is because there are a number of essential operational challenges to hardware automation that no one vendor can overcome, while also developing innovative technology. If the promise of modern automation is to be realized, insiders need to tackle some key challenges that hinder the sector's ability to expand and scale quickly and effectively, including installation and maintenance costs, the hidden costs of automation, customer service, workforce training, and autonomy exceptions. These challenges are best understood as service lifecycle management (SLM) and referred to as the post-sale parts of the automation business.

INSTALLATION COSTS

The installation costs of a material handling robot solution can vary massively, with some companies suggesting that full installation would take up to 3 months. Meanwhile, others proclaim that they offer “robot-in-a-box” solutions that require minimal time to deploy. Installation costs also include evaluation and simulation expenses, which tend to involve competency with digital twins. Installations are not a strong source of revenue for vendors and expend considerable time required for traveling, site mapping, equipment setups and testing, and administrative scheduling. All of this effort could be redirected toward product development and sales.

COVID-19 has affected the ability to deploy and install systems effectively and serves as a reminder of how macroeconomic events can affect normal professional functions and prevent business continuity. In response, some automation vendors have made more of an effort to develop remote deployment capabilities, which often requires help from localized technical specialists. Installation activities provide an excellent example of when to use external support, and some automation vendors are already delegating this function. For example, Mobile Industrial Robots (MIR), an AMR solution provider, is directly responsible for installing its equipment for roughly 20% of its largest clients, while delegating the other 80% to channel sales partners and distributors. But this also has potential downsides, the most prominent being inconsistent rollouts and varying levels of technical capability across a wide range of sales and service partners. Choosing the right partner becomes critical.

MAINTENANCE AND REPAIR COSTS

Automation and robotics providers can receive revenue from maintaining and repairing their equipment over a 5 to 10-year life span. Organizations may deploy considerable resources for repairing and maintaining robotic equipment, and this total lifecycle support cost may impact the productivity improvements afforded by the initial investment. Therefore, maintenance functions require effective management to control or even decrease repair costs over the equipment's lifecycle.

The cost of an individual robot and the maintenance will vary widely. Under-ride systems like those from Amazon Robotics are priced between US\$20,000 and US\$40,000, depending on the total payload, while autonomous pallet stackers and narrow aisle forklifts might range between US\$40,000 and US\$300,000 for the most sophisticated and heavy solutions. Alongside the challenges of automation and the robot's upfront cost, the cost of ownership could be up to 20% of the price value each year. For example, a US\$35,000 robot requires an additional US\$7,000 in maintenance costs annually. Said robot can expect to have a 4-year Return on Investment (ROI) horizon, and the ancillary costs can pile up quickly.



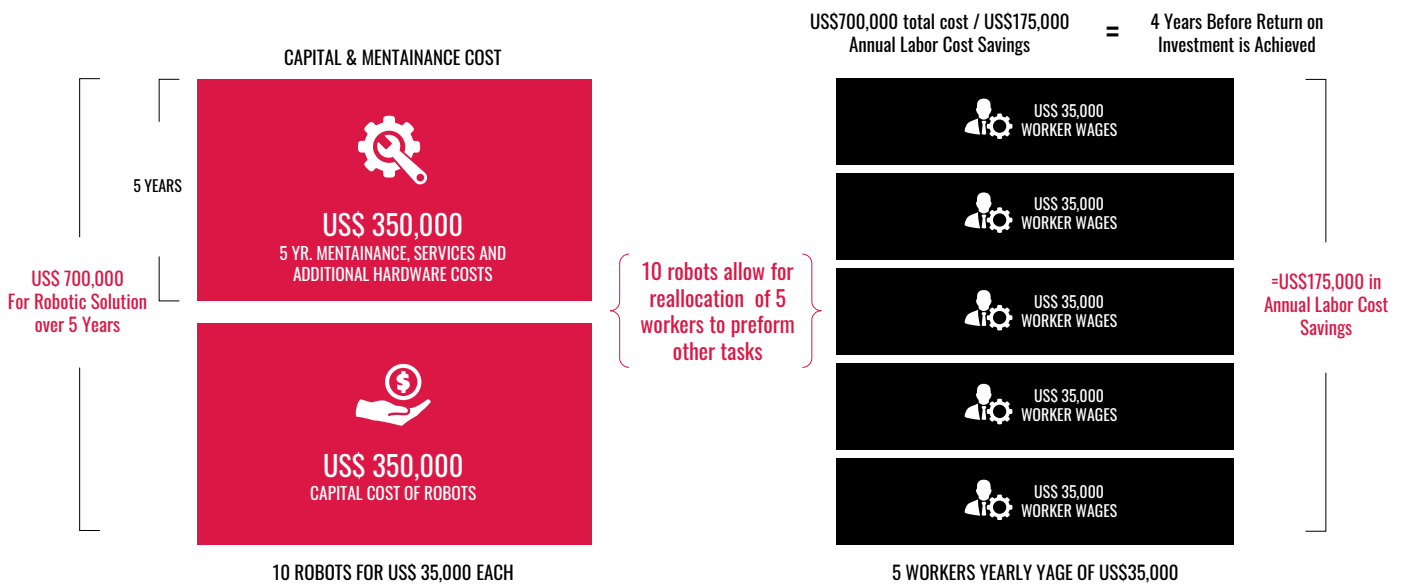
To elaborate, if a company buys 10 robots for US\$35,000 each (US\$350,000 in total), and the annual cost of maintenance and additional service cost is 20%, then the total investment over a 5-year period would be US\$700,000. Figure 2 provides a scenario for an expected ROI. One can conservatively estimate that 10 robots would allow for the redeployment of 5 workers earning yearly wages starting at US\$35,000. Based on this, the annual labor cost savings are US\$175,000, making it 4 years before the US\$700,000 cost in Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) is recouped. Some larger companies can accept ROI horizons like this. But for the automation industry to meet its lofty targets, there has to be an appeal to companies that require much shorter payback. This can be achieved by reducing maintenance costs and using service models to reduce CAPEX. But to engage in these strategies, automation vendors will need onboard expertise from third parties.

Of course, there is value to automation beyond simply reallocating workers away from dull, dirty, and dangerous tasks. Nevertheless, a carefully considered maintenance and repair management program is essential to shortening the path to ROI and convincing potential users to make new investments in equipment. The purpose of aligning with strategic partners to perform critical components like customer service, support, and maintenance reduces those additional costs quite significantly, thus shortening ROI by years.

THE HIDDEN VALUE OF AUTOMATION

When manufacturers or logistics companies commit to deploying automation, they know they are making a strategic investment in the future. But without some high degree of visibility about the actual productivity gains, many remain skeptical and hesitant. It is critical to have actionable data on

Figure 2: ROI Scenario for Modern Automation Solutions
(Source: ABI Research)



hand that provides key metrics. As an example, it is imperative to measure equipment downtime. Ultimately, what gets measured gets managed, and therefore the need for an effective data analytics regime is paramount.

Automation and robotics vendors increasingly emphasize the value they can bring to analytics via useful data collection and

orchestration. But any data solution based on dozens of various robotic systems is complex to build, and complicated and time-consuming to operate. While both automation vendors and end users have plenty of experience in gathering vast troves of data, they still face challenges like those listed below:

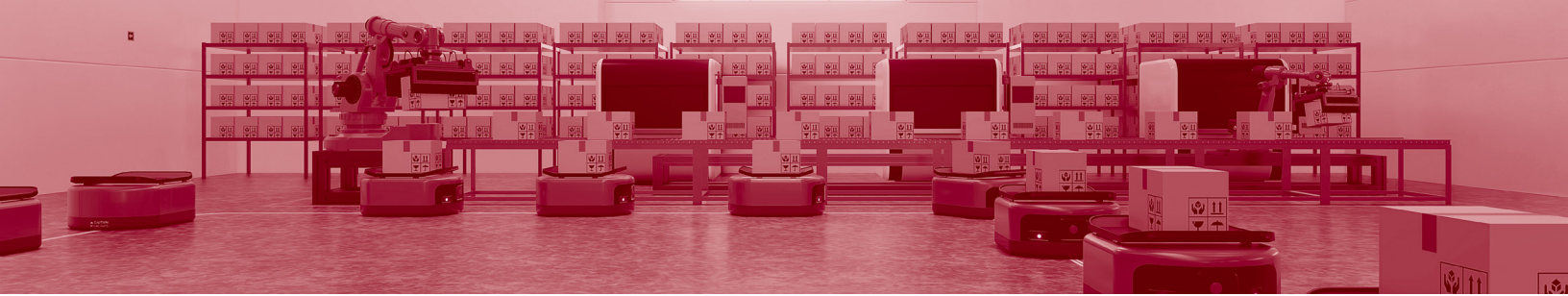
- Before they gain any value from data, companies need to know what answers they are looking for. Many companies become saturated in data, but lack actionability or even clarity about what the data mean, and large datasets do not equal data quality. Often, an exercise in capturing the most data leads to overly complex dashboards and crowded graphs that do more to obscure than provide insight.
- Data needs to be contextual, actionable, and timely. If managers cannot impact their operation quickly through effective data analysis, then their entire data value chain fails to justify its purpose. An example of material handling autonomy exceptions is potential traffic congestion. If the overseer hears about a traffic stop in a facility an hour or even 5 minutes after the fact, the operation has come to a standstill. If the data analysis is timely, they can be notified of potential traffic stops even before the fact and can use their fleet management system to change routes pre-emptively. There is considerable demand for real-time intelligence, but many are not well set up to deliver a turnkey data solution.
- This is an area where third parties can help. There is a burgeoning ecosystem of data specialists that offer predictive and even prescriptive analytics through the use of historical data. They can also assist by educating vendors on best practices for data collection, processing, and feature extraction.



CUSTOMER CENTRICITY

As emphasized in previous sections, technological innovations are highly dependent on buy-in from the customer or end user. The perceived pain of adopting new technologies like automation or robotics must be superseded by two things: confidence about the technology's viability, and concern regarding the cost of inaction. In essence, an automation vendor requires a potential customer to change their behavior, which is challenging because implementing automation and robotics involves a high degree of complexity and is prone to initial trial-and-error or algorithm failure in certain cases, commonly known as edge cases. If customer service and support are lacking, end users could be quick to sour on their technology investment, and the history of automation is already replete with failed relationships between vendors and end users.

To succeed at scaling their operations, those offering automation solutions cannot merely think like roboticists. They have to be customer-oriented. Vendors also need to have world-class customer service that facilitates buy-in not just from executives, but from site managers and laborers. The entire customer workforce should be looked at holistically and included in the technology adoption. It is not enough to rely on a select few gurus or automation advocates planted in the customer base, as automation stands to impact the entire workforce. Providing this level of customer service and attention while focusing on optimizing and innovating is one of the chief challenges of automation companies as they exit the engineering lab and startup phases.



WORKFORCE TRAINING

The rollout of automation counterintuitively requires a significant investment in workforce development, as an effective operation will not merely require only an automation solution, but a technically proficient team to implement, operate, and maintain the solution. There is considerable variation in the skills and abilities of the workforce to consider. For example, training a group of technically-capable production workers in a manufacturing environment will require different training skills than warehouse pickers further down the supply chain.

Despite the prevalence of automation “experts” and “gurus,” knowledge about automation and robotics is heavily segmented and is specific to different technologies and use cases. Training for one type of equipment may not apply to a different kind of hardware. This makes introducing new systems into a working environment more challenging for the automation vendor. The organizations purchasing and implementing an automated solution will often question automation and robotics suppliers about whether they offer easily supportable systems and provide extensive training for their intra-company departments and individual employees. Many automation vendors are not in a position to provide this service while simultaneously focusing on their technology offering.

For many automation vendors, thinking about training beyond the initial implementation phase is an opportunity cost that can be difficult to justify. Given the immense pressure to meet demand, most automation vendors will face significant resource limitations. Consequently, those with an established number of deployed robots are increasingly looking for partners that can

be trusted to provide and take responsibility for critical services like ongoing employee training, materials development, and support.

AUTONOMY EXCEPTIONS

“Robot-in-a-box” is an automation concept promoting the idea that a product, usually an AMR or cobot, can be deployed in a matter of hours with minimal calibration or installation costs. Many companies are using this slogan in their marketing campaign, but very few comply with the concept. While this might work with pilot schemes and some isolated deployments, precise calibration and installation on-site is almost systematically required.

The prospect of “robot-in-a-box” is far from fully realized. More deployed robots need more engineers to look after them. In this sense, automation companies do not necessarily become more efficient with scale. Autonomy exceptions, or interruptions in the robot’s autonomous operation, are a perennial problem for vendors and end users alike. At this stage of market development, building up edge cases is a net positive for the industry. It can be a simple case of traffic congestion or failing to scan a damaged barcode.

Theoretically, more edge cases should enhance performance through incremental improvement and AI training. But for the foreseeable future, autonomy exceptions will be a consistent problem for operators and vendors alike. This is best remedied by 24/7 customer service, which many vendors find difficult to provide. Many exceptions will be easily solvable, but will distract vendors from more serious incidents. There is a market for third parties that can prevent vendors from being overloaded with queries and issues by dealing with the 75% that can be solved by a quick call with a technician.

THE STRATEGIC VALUE OF ONBOARDING AND PARTNERSHIPS FOR SERVICE LIFECYCLE MANAGEMENT

The opportunities facing automation and robotics suppliers are expansive, but the challenges that come with scaling for demand over the next decade are manifold. Solving the challenges associated with service and support of the equipment is an opportunity cost that has to be balanced with product development and continual improvement of the technology stack.

The need to divert resources away from profit-making parts of the business will inevitably test an automation company's ability to be self-sufficient. Of the vendors that have been fastest to market, the notion of having complete control of one's solution is neither feasible nor desirable. Self-sufficiency in less productive parts of an automation business is challenging. Installation, periodic maintenance, customer service, and technical training all require additional costs that encumber profitability. It is particularly difficult to focus on product development and ensure quality control when expanding to different regions. This is critical, as nearly all automation vendors are pitching to a global market.

The value of third-party onboarding is not merely hypothetical. It is already part of the business model for those automation vendors with the most experience in scaling quickly. As a market leader in autonomous navigation, Brain Corp has led AMR companies in terms of installed fleet size and enabled 14,000 systems globally, making it the largest deployer of AMRs for public spaces. As a market leader, it stresses the importance of partnerships as a critical part of its business strategy.

Technology providers, system integrators, and third-party service parties are critical to the success of the robotics industries. It is very costly to vertically integrate everything.

— Phil Duffy, VP Product & Program at Brain Corp

Many automation players accept this philosophy and fundamentally realize they are not positioned to scale up operations quickly without support from strategic partners

for competencies like customer service, maintenance, and repairs. In ABI Research's consultation with 20 automation vendors, 18 (90%) had or were strongly considering using strategic partners for service lifecycle operations like field maintenance, helpdesk/technical assistance, training, and software applications. One of the fastest-growing developers of automated fulfillment centers, has stressed that while it plans to have hundreds of micro-fulfillment centers with hundreds of thousands of robots, there is very little value in building the internal infrastructure to employ thousands of on-demand engineers and customer support workers to deal with incidents.

Some entrants to the market have been more reticent to outsource customer support services. They may be hesitant to trust third-party customer service providers, fearing such partnerships could compromise control over customer data and their intellectual property. However, when the trust barrier is removed and strategic partnerships are formed, outsourcing parts the service lifecycle become greatly beneficial to automation vendors.

Revenue sharing with the right strategic partner can also be a benefit if it enables new business models for the vendor. There has been much interest in developing Robotics-as-a-Service (RaaS) programs, but the initial capital costs of not receiving upfront product sales revenue make such a model challenging to achieve for smaller automation and robotics vendors. RaaS entails a comprehensive service portfolio that can include customer service, 24/7 hotlines for inquiries, onsite inspections and consulting, employee training, installation, operations, and redeployment. This is an immense workload for the vendors. The RaaS model places capital burdens on the vendor; vertically integrating all parts of the service would place even more responsibility on them, limiting their ability to scale and meet market demand. With strategic partners assisting onboarding IT functions, training, on-site repair, and 24/7 customer service, vendors can more readily have RaaS as an option they can offer potential customers. This opens up vendors to the benefits of RaaS, namely the huge increase in potential customers that cannot afford major capital investments.

INSTALLATION

Installation is a critical stage of service lifecycle management that could determine future sales and make or break a client relationship if not done well. However, managing multiple installations across different regions is a costly proposition due to time and travel, logistics, and integration with IT/OT systems. Under these conditions, it may become difficult for automation vendors to keep up with their implementation schedules as their customer base increases.

While it could make sense for smaller automation players with a limited customer base to take care of installation support on their own, many large-scale automation and robotics suppliers understand the challenges of delivering end-to-end solutions to their customers. Some automation vendors already predict that end-customer demand will become too high for automation vendors to deliver their own early installation support without limiting other parts of their business. One of those companies is Swiss autonomy solutions provider BlueBotics, with its strategy of partnering with OEMs and system integrators to enable more than 2,500 systems without incurring significant scaling costs.

A major example of installation challenges is integrating autonomous robotic systems into the more expansive OT infrastructure like WMSs. It is not uncommon for smaller end users to forego integrating automation solutions into the WMS for warehouse and manufacturing applications, as it takes too long. This allows for quicker installation, but fundamentally limits the solution, especially in regard to effective fleet management and analytics. While a company might not need WMS integration for one or two robots, it is essential for a fleet. The potential gains for automation vendors will not be in end users buying one or two robots per facility, but instead buying in bulk to deliver comprehensive automation. To integrate with WMSs and scale quickly, vendors can use partnerships with the providers of management systems, as they work with specialized automation software vendors that offer value in linking up different technology stacks in an efficient manner.

Third parties are primarily aiming to help automation vendors with post-sale installation work, notably commissioning,

deploying, and training employees. However, there could be added value in third-party automation experts assisting vendors at the very beginning of the service lifecycle. This would include offering ROI analysis services and use case design concepts in the long term. This will provide third-party validation for end users looking for neutral brokers to help them make the best purchase.

OPERATIONS

Once the installation is taken care of, the most extensive section of the lifecycle is the daily maintenance and operation of autonomous systems equipment. Operational use is where hidden costs percolate and where the importance of excellent customer service becomes genuinely apparent. Business reports, analytics, technical and maintenance services, and dispatching service engineers to sites all add enormous costs and challenges for an automation and robotics vendor.

Almost all vendors will have customized software tools that accompany their hardware, often in Fleet Management Systems (FMSs). But these systems often need to account for interoperability with other robotic systems, management systems, and external IT infrastructure. Therefore, the software and services developed internally by automation vendors are often insufficient to meet a customer's needs. As a result, there is a growing demand for external onboarding assistance for particular software applications related to business analytics, integration with newly introduced management systems, and interoperability with other pieces of equipment.

In addition, industry leaders predict a need for external partners that provide training and customer service. Increasingly, newer entrants to the market are integrating third parties into their operations, primarily to ensure consistent customer service across different jurisdictions. Doing so internally would be impractical and working with a dedicated partner, as opposed to a wide range of distributors, ensures a quality control whether the robots are deployed in America, Europe, or Asia. One of the newer entrants is Gideon Brothers. This Croatian AMR company, which has already garnered attention in the American market, is looking for third parties for training activities.

We are in the process of validating and specifying collaboration and service options with potential partners who could provide sufficient support globally, training activities included.

— Matija Kopic, CEO of Gideon Brothers

The task of automation and robotics vendors trying to develop in-house capabilities for the entire service lifecycle management process is prohibitive, costly, and likely to slow down growth in deployments and adoption. Simultaneously, the benefits offered by partnerships with service providers for operational processes are significant, enabling increased satisfaction from the end user, a chance to remain focused on product development, and the potential to scale consistently and quickly across multiple regions and clients. 6 River Systems, a leader in e-commerce warehouse automation and fulfillment solutions at more than 50 customer sites, recognizes the importance of planning for post-installation services.

Third parties are a big part of our scaling plans. The partners we are working with are competent in the technical skills required to service our system and in many cases are local to our customers' sites – so they can get there quickly.

– Fergal Glynn, VP of Marketing at 6 River Systems

A strategic service partner can also help facilitate revenue by monetizing additional warranty or maintenance costs into fee-based support care programs for end users that subsidize their service, while also greatly expanding an automation vendor's capacity to expand at a faster rate.

To conclude, automation during the next decade will need to be scalable at speed, flexible, and replicable across a wide array of use cases, environments, and regions. It is a lot for one company to retain consistent quality, while attending to these challenges, and vendors are beginning to take note. The future of automation and robotics will be defined not by single entities or loose distribution networks, but by deep partnerships between those providing technology and those assisting and supporting the SLM.

RICOH SERVICE ADVANTAGE

The market demand for third-party support in the automation and robotics sector is expanding. Of the vendors assisting automation supplier OEMs, Ricoh is among the most prominent, with an extensive list of established automation clients. Through its Service Advantage offering, Ricoh has provided services for customer support, software integration, on-site hardware repair, and many other use cases.

With 90,000 global employees, Ricoh serves a wide range of automation vendors helping them achieve effective Service Lifecycle Management (SLM) programs. The company has established a full complement of technology lifecycle services for automation equipment deployed in a variety of market verticals, including manufacturing, healthcare, retail, security, and logistics. Ricoh's relationship with automation vendors is based on strategic partnerships that are expected to develop into more extensive collaboration over time.

In assessing the automation industry, ABI Research has highlighted a shift in attitudes from 2017 to 2020. Previously, many automation and robotics vendors hoped they might one day replicate the success similar to that achieved by the global cloud platforms offered by tech giants like Amazon and IT giants like Microsoft. But they have come up against the scaling challenges implicit within the automation space, which as this paper has explained, are considerable. The market, led by both the established market leaders and newer entrants, is looking for trusted partners to assist with lifecycle service and support tasks. For a number of vendors, Ricoh has become the default choice for a wide range of SLM functions, ranging from customer service to hardware repair.

Looking forward, many automation and robotics vendors are considering onboarding trusted, strategic partners for equipment lifecycle tasks like installation, post-commissioning, customer support activities, hardware and software maintenance, and remote technical support. Currently, this dedicated service and support market is limited to a select few providers, with Ricoh being among the largest and most well-resourced. The automation and robotics industry will see incredible growth for solution providers that understand how to scale and use strategic partners effectively.



KEY TAKEAWAYS

- **Problem—As Demand Increases, the Challenge Shifts to Supply:** Automation solutions will become mainstream throughout the next decade, as the demand for modernizing material handling and fulfillment drive adoption forward. This enthusiasm will not be limited to the supply chain, as construction, agriculture, real estate, retail, and other emerging markets adopt robots for myriad tasks. But meeting this demand is going to be difficult, given the inherent challenges automation vendors face throughout the lifecycle. Failure to build effective capacity in competencies like customer service, maintenance, operations, and training could even hinder adoption and lead to industry disillusionment.
- **Solution—Service Lifecycle Management Challenges Require Collaboration:** There are many different competencies required to deliver a comprehensive automation solution. Most automation vendors will struggle to scale effectively without external assistance. Previously, the use of third parties was often case-specific and limited. But moving forward, the challenges of SLM demand the building of long-term partnerships with dedicated service providers.
- **Implication—Third Parties Are Becoming Increasingly Important:** Much as there is a demand for automation by the end user, there is a demand for third-party assistance from the automation vendor. Currently, Ricoh is among the largest. The rise of these services will change the structure of the entire automation ecosystem, as the market becomes defined by a demarcation of responsibilities between the vendor and the service provider.

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249 South Street

Oyster Bay, New York 11771 USA

Tel: +1 516-624-2500

www.abiresearch.com

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