EBOOK

Unlock value with integrated services across the product lifecycle

Accelerate readiness.
Simplify execution.
Recover value.

flex

DESIGN

SOURCE

BUILD

DELIVER

RECLAIM

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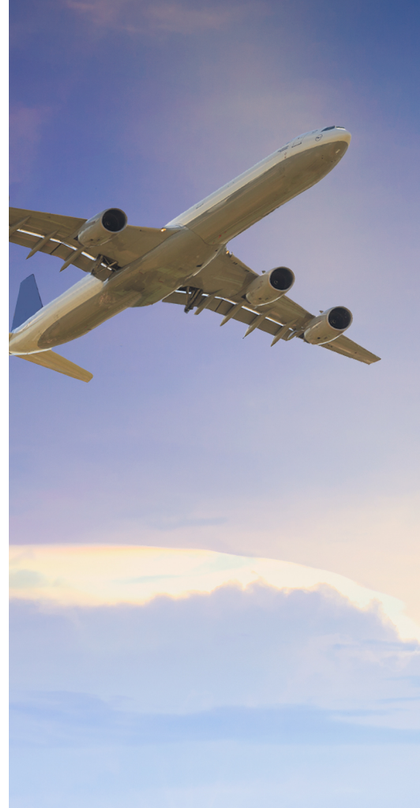
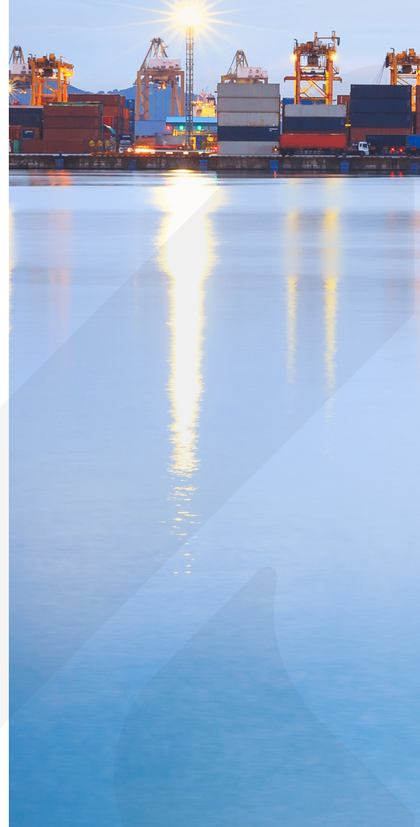
Executive summary

Doing business on the global stage has never been more complex. There are supply chain risks around every corner, from geopolitical instability and labor unrest to facility outages, natural disasters, and shifting tariff and compliance landscapes. Rapidly advancing technologies further complicate matters, requiring ever-vigilant attention to product design, component availability, and multi-vendor interoperability. The insatiable thirst for more-better-faster-next also complicates demand and the ability to scale quickly to meet it. And amidst all of this, heightened interest in sustainability and cost recovery obligate companies to attend to their environmental impact, from their carbon footprint to the disposition of products at end of life.

For companies focused on product innovation and development, navigating the non-core — yet no less essential — aspects of the product lifecycle in-house can require a significant investment in time, money, and resources. Outsourcing to an experienced global partner can be a game-changer, and interest in outsourcing some or all non-core services is rising. Demand for product lifecycle management solutions is expected to grow at 9.2 percent CAGR, with the market reaching $54.4 billion globally by 2030.[1]

An integrated and well-executed services strategy is a strategic imperative. It's also a competitive differentiator, enabling companies to reduce risk, lower costs, and accelerate time to market without compromising quality or the customer experience. Flex helps companies across industries bring innovation to market faster and more cost-effectively, marrying advanced manufacturing and supply chain capabilities with fully integrated services precisely aligned to business priorities at any stage of the product lifecycle.



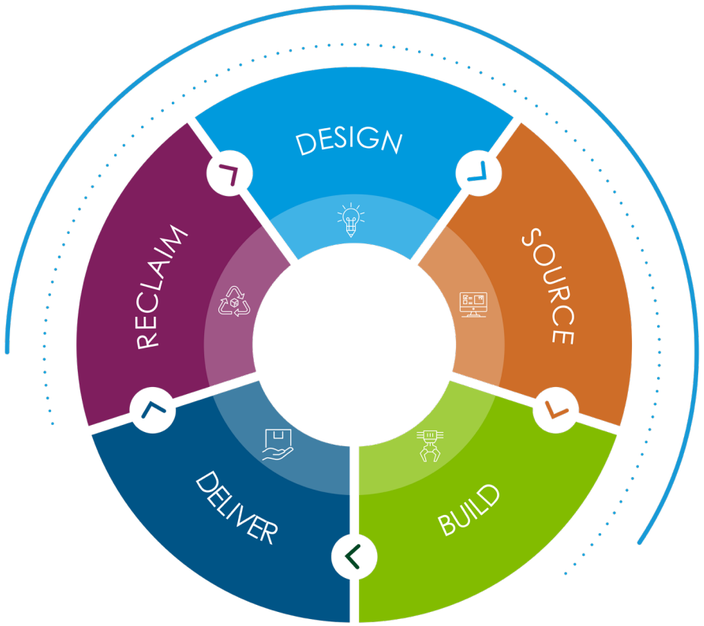


THE SERVICES CONTINUUM

Design, source, build, deliver, reclaim, **repeat**

From supply chain volatility and rapid technological change to the financial and legal minutiae of tariffs and environmental regulations, companies face array of challenges as their products move from idea through end of life. With time to value at a premium, partnerships take on greater significance. Needs are as varied as the companies themselves, but the services continuum follows a familiar path regardless of sector: design, source, build, deliver, reclaim, repeat.

The cycle is straightforward for any given product, but it's the rare company that only has one product in development, on the production line, or in market at a time. In practice, product lifecycle management is like orchestrating many interdependent systems moving in parallel across the portfolio. Even the manufacturing and distribution of a single product requires precise calibration with component suppliers and end-customer demand.



Outsourcing for flexibility and agility

The product lifecycle begins long before manufacturing commences and lingers well after the sale. Although companies may not always need a full complement of services, it's a fair bet that one or several can be utilized to streamline the process. Tapping expertise outside the company keeps internal focus squarely where it should be — on innovation, not on staffing up, standing up, and maintaining ancillary capabilities in-house. A partner with end-to-end services gives companies the flexibility and agility to engage fluidly in sync with product roadmaps, manufacturing timelines, and end-customer demand.

This is where Flex comes in — providing comprehensive, integrated support tailored to each phase of the product lifecycle with solutions such as:

DESIGN FOR EXECUTION
Customer Needs: Accelerate readiness, de-risk launch, optimize design
Flex Solution: DfX, prototyping, and early engineering support

SUPPLY CHAIN RESILIENCE AND COMPONENT SOURCING
Customer Needs: Secure supply, forecast accurately, reduce cost
Flex Solution: Tailored sourcing, buffer programs, and supply visibility

ADVANCED MANUFACTURING
Customer Needs: Scale efficiently, reduce complexity, meet standards
Flex Solution: In-region, vertically integrated manufacturing

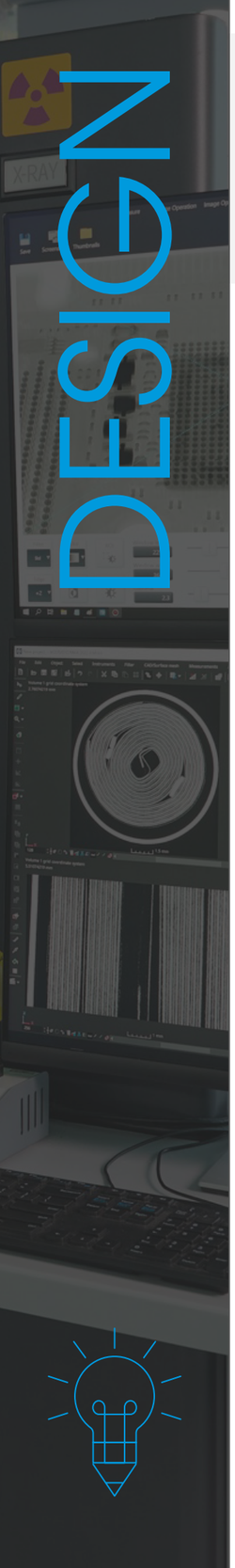
VALUE-ADDED FULFILLMENT AND LOGISTICS
Customer Needs: Ship faster, customize late, serve all channels
Flex Solution: Regional fulfillment, kitting, and omnichannel support

AFTERMARKET SERVICES
Customer Needs: Reduce waste, recover value, improve sustainability
Flex Solution: Reverse logistics, reuse, and circularity analytics

To help you unlock greater business value, Flex provides **end-to-end lifecycle services** that are:

- **INTEGRATED** – Designed to work together seamlessly
- **TAILORED** – Aligned to unique needs and customer requirements
- **PROVEN** – Tested and proven across industries
- **SCALABLE** – Adaptable to any region, any infrastructure
- **FAST** – Built to accelerate execution and shorten deployment timelines

See the full portfolio of Flex's end-to-end, integrated product lifecycle services on page 16



There are endless variables to consider when it comes to product design. Performance and functionality are just the tip of the iceberg. How will decisions made at the outset affect component availability and manufacturing timelines? What are the consequences for repairs or obsolescence? What is the impact on sustainability and value recovery?

Bringing together experts from critical phases of the product development process to vet a design before it gets to production saves time, money, and headaches down the road. Early collaboration can make the product easier and more cost-effective to manufacture, test, and assemble while enhancing long-term reliability and lessening environmental impact.

THE FLEX **ADVANTAGE**

Simplify manufacturing with design-for-excellence (DfX) expertise

Flex supports early-stage product development with design engineering, prototyping, and DfX services that reduce production risk and speed time to launch. From rack systems to embedded components, we help customers optimize performance, simplify manufacturing, and scale with confidence.

Rapid prototyping and early validation
Shorten development cycles with quick-turn builds, test simulations, and actionable design feedback.

DfX engineering services
Design for manufacturing, testability, and assembly (DfM, DfT, DfA) principles reduce costs, streamline production, and accelerate ramp-up.

Joint design and engineering resources
Scale faster by tapping into Flex's global engineering teams for co-development, new product introduction, and technical augmentation.

Value engineering and cost optimization
Improve margins and manufacturability by simplifying designs, eliminating waste, and identifying lower-cost alternatives up front.

Configurable BOM and approved vendor lists
Streamline parts management for custom product configurations and ensure components meet quality, compliance, and reliability standards.

What Is DfX?

DfX is a set of methodologies and principles that guide designers and engineers to create products that excel not just in functionality, but in manufacturability, reliability, testability, sustainability, and serviceability. Its core principles center on quality improvement, cost reduction, and efficiency enhancement. Leveraging DfX services enables companies to deliver high-quality products that are cost-efficient to make and maintain.

Case study
Robotics | Design for manufacturing

Enhancing manufacturing efficiency with expert engineering support

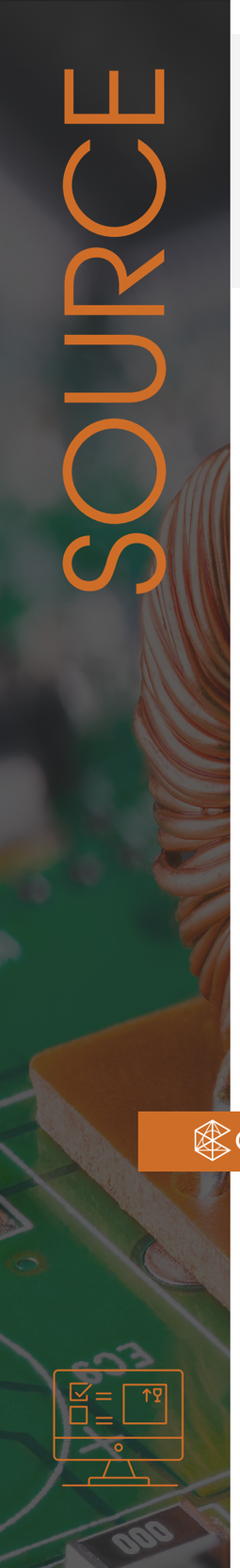
After launching its flagship mobile robot system, a leading robotics and intelligent automation innovator sought a new manufacturing partner to help the company grow within the retail sector and expand into new geographies and industries. While the prototype robot system was well-suited to the task at hand, the design was not optimized for manufacturing, nor could it accommodate the frequent engineering updates the company sought as it built systems tailored to various customer warehouse environments. The client engaged Flex to refine its design for production, build a resilient supply chain, and manufacture precisely calibrated systems with flexibility, reliability, and scalability in mind.

Building resilience from day one: Why supply chain strategy needs to start at the design phase

Competing in the global marketplace requires more than just smart sourcing and manufacturing — it demands foresight, agility, and resilience built into your product design from the beginning. Decisions made during the design phase influence everything that follows. Strategic planning in the design phase dramatically lowers the odds of costly redesigns, missed delivery windows, and broken customer promises. Discover the six questions every product development team should be asking to build resilience into the supply chain from the outset.

Read the blog

Decisions made during this crucial design period lock in everything from materials, components, and suppliers to tooling and tolerances.



Supply chain disruptions aren't merely inconvenient, they're costly. Financial losses, customer dissatisfaction, and reputational damage compound in a hurry the longer an issue lingers. McKinsey estimates that a company can lose 30 percent to 50 percent of a year's EBIDTA (a measure of profitability) to a single major disruption.[3] No industry is immune.

Disruptions are also quite frequent — by one count, 10,629 in the first half of 2024 alone.[4] Supply chain operations can boost resilience or exacerbate vulnerability, depending on how effectively they monitor risk, deploy mitigation strategies, and execute business continuity plans. Building resilience into the supply chain enables companies to anticipate, respond to, and recover from disruptions faster, protecting the bottom line and creating a competitive advantage as others struggle to pivot.

THE FLEX **ADVANTAGE**

Strengthen supply chain resilience as a service

Tailored inventory programs

Flex's tailored inventory programs complement our global supply chain by ensuring a steady supply of onboard, hardware, and commodity components, helping companies meet demand and stay competitive in fast-moving markets.

Strategic buffer inventory
Capture upside from demand spikes and respond faster to change.

Centralized supply chain management
Reduce sourcing risk and improve planning accuracy.

Customized solutions for original equipment manufacturers (OEMs)
Align inventory to customer-specific needs and reduce obsolescence.

Global material logistics
Streamline execution across regions and rebalance excess inventory efficiently.

Data-driven decision tools
Improve visibility, forecasting, and risk management across the supply chain.

Coreworks A Flex Company — **Components portfolio for speed and reliability**

Direct-to-OEM component supply
Reduce sourcing complexity and lower total cost of ownership through direct access.

Standard and custom component manufacturing
Consolidate suppliers and accelerate time to market with tailored parts.

Design and engineering integration
Design in quality and flexibility from the start of the lifecycle.

Resilient global fulfillment network
Deliver global fulfillment with competitive lead times, reliable component access, and resilient, region-compliant operations.

5 keys to supply chain resilience

Supply chain professionals break down resilience into five key components:

Flex Pulse® intelligent supply chain tools

Optimize supply chain processes, enhance decision-making, and bolster resilience in a dynamic global landscape with:

Flex Pulse Actionable Insights – Leverage real-time, end-to-end insights for more intelligent supply chain decisions, increased agility, and responsiveness.

Flex Pulse Network Design – Rapidly model scenarios to analyze and optimize supply chain network design and planning for cost savings, service level improvements, and inventory reduction.

Flex Pulse Risk Management – Identify risk early in the product lifecycle to significantly mitigate supply chain risks — including production disruptions and financial impacts — in the product build stage.

$184B Global cost of supply chain disruption annually driven by raw material volatility, delays, and increased logistics costs.[6]

Strategy in action

COMPANY	Global industrial technology leader specializing in smart metering for water, gas, and electricity
IMPACT	Reduced unforecasted supply chain costs by nearly **$3 million** annually and captured **19 percent** of previously unplanned revenue in the first year
HOW THEY DID IT	Leveraging Flex's value-added services to implement a dynamic buffer and inventory program that stabilized supply, reduced unfavorable procurement costs, and enabled faster response to demand surges

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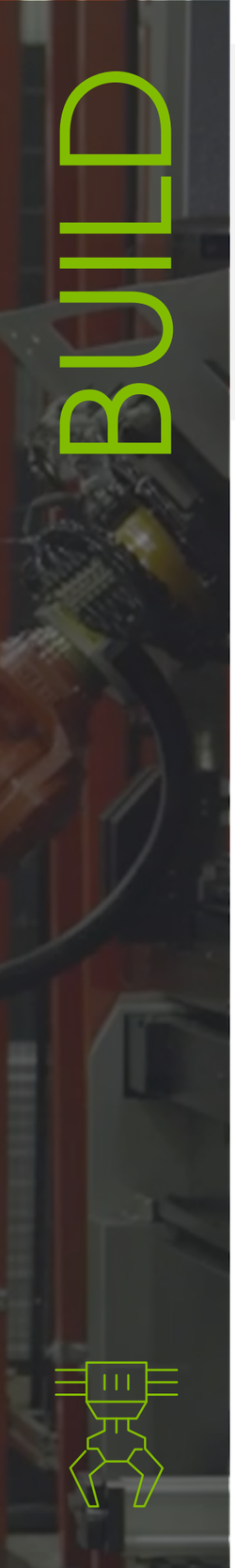
Supply chain leaders experienced challenges in 2024[5]



Think “data center” — what image does it bring to mind? For many, it’s row upon row of racks with servers and other IT equipment blinking in the semi-darkness. Their ubiquity can make them an afterthought in data center design — a quick math problem based on square footage. But the advent of high-density computing puts the space inside at a premium. More compute means more power, and more power requires more cooling. On the horizon: 1+ MW racks enabled by +/- 400 VDC and 800 VDC power systems and advanced liquid cooling solutions. The race is on to maximize every centimeter.

A critical infrastructure component, racks enable efficient use of space, effective power and cooling, and scalable growth. The faster they’re built, integrated, and deployed, the faster companies can take advantage of computing power in a hypercompetitive era where 10 GW of data center space is expected to break ground in 2025, and another 7 GW will likely reach completion.[7] With time to compute of the essence, partners that can deliver fully integrated racks at scale globally offer a distinct competitive advantage.

THE FLEX ADVANTAGE

Build and deploy at scale with vertical rack integration

Flex helps companies scale faster and simplify operations in the AI era with vertically integrated, cost-effective rack and enclosure solutions that are custom-built and manufactured near deployment sites worldwide.

Vertically integrated global manufacturing
Simplify the supply chain and accelerate compute deployment with full rack ownership.

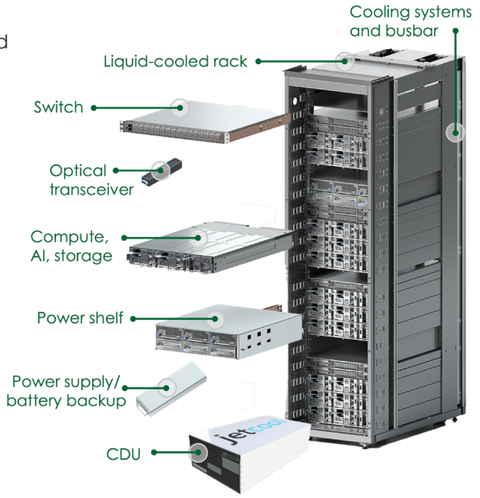
Advanced automation and quality controls
Ensure compliance and consistent high-performance validation.

Custom engineering and compliance design
Align inventory to customer-specific needs and reduce obsolescence.

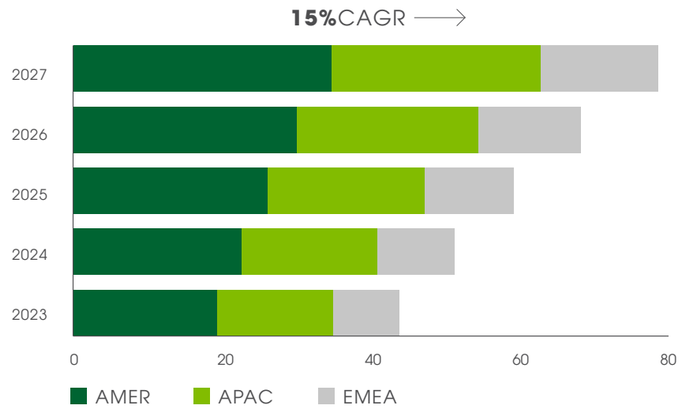
In-region scale and deployment speed
Enable hyperscale deployments faster while reducing emissions through regionalization.

ORv3 solutions

Balancing rack standardization and customization, the Open Rack v3 (ORv3) specification meets several hyperscaler design imperatives and enables them to achieve more compute per square foot. Flex offers complete vertical integration of ORv3 rack solutions, from the fabrication of the frame to the design and manufacture of the IT components, power products, and liquid cooling systems that reside therein.



Global data center capacity (GW)[7]



Sources: JLL Research, Structure Research | Note: Capacity includes hyperscale and colocation.

Strategy in action

COMPANY	Hyperscaler
IMPACT	Accelerated global rack deployment by **40%** while cutting sourcing costs and lead times
HOW THEY DID IT	Unified component sourcing, ORv3 rack fabrication, and in-region fulfillment for faster, more sustainable expansion

The work of getting a product to the end customer doesn't stop at the production line. Moving finished goods from here to there is no simple matter. Transportation, warehousing, kitting, late customization, distribution, and other logistics-related activities must be tightly coordinated, often globally. Companies that go to market through a variety of channels — business, retail, direct-to-consumer — face a particularly complex fulfillment landscape. And as we noted earlier, supply chains can suffer disruptions at any moment.

Companies often turn to logistics and supply chain management partners to ensure seamless delivery of their products. While individual aspects such as warehousing and inventory management can be outsourced to third-party logistics (3PL) providers, it's often more expedient to engage a strategic partner with the expertise, capabilities, and geographic reach to manage the entire supply chain holistically — a fourth-party logistics provider (4PL). Aligning supply chain strategies with business objectives optimizes the entire logistics ecosystem, impacting everything from inventory levels to shipping costs.

THE FLEX **ADVANTAGE**

Get finished goods to end customers faster

Flex's forward logistics and fulfillment services streamline the movement of finished goods, enabling faster, more cost-effective delivery to business, retail, and direct-to-consumer customers globally.

Omnichannel fulfillment
Serve all channels flexibly, including direct to consumer, retail, B2B, and marketplaces.

Kitting and late customization
Reduce time to market and improve delivery accuracy with tailored final assembly.

Managed inventory and warehousing
Optimize inventory levels and reduce storage and shipping costs.

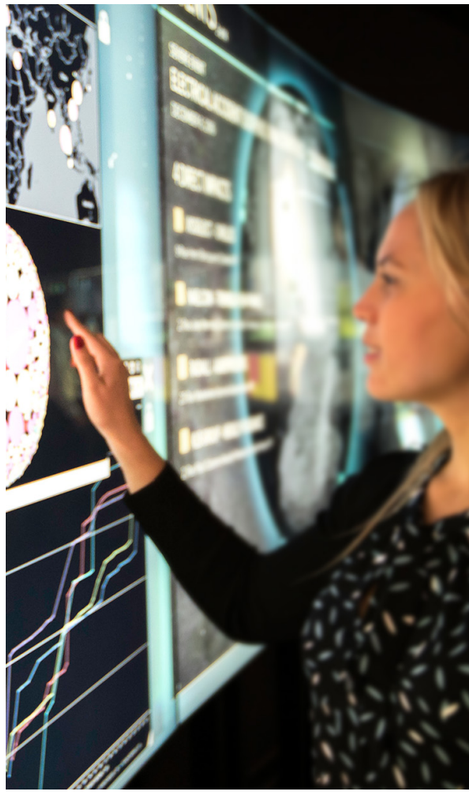
Managed logistics and transportation
Simplify fulfillment and boost customer satisfaction through end-to-end visibility.

What OEMs should look for in a 4PL

4PLs are strategic business partners that oversee the entire supply chain and orchestrate various service providers — transportation, warehousing, distribution, trade compliance, kitting/assembly, and others — on behalf of an OEM.

Look for:

- End-to-end supply chain expertise inclusive of strategy, optimization, and transformation
- A proven track record in the industry, especially for those navigating complex global supply chains
- Real-time visibility across all suppliers, carriers, and operations
- Predictive analytics and root cause analysis expertise to avoid and address issues, respectively
- Seamless scalability when entering new markets, consolidating operations, and addressing shifts in demand
- Multimodal coordination to move goods by air, sea, land, and rail expediently and cost-effectively
- Compliance and reporting that supports environmental sustainability frameworks



$2.18B
by 2030

The global logistics and services market for 3PL and 4PL providers is growing at a **9.25%** compound annual growth rate (CAGR).[8]

Strategy in action

COMPANY	Global technology company
IMPACT	Met global demand while maintaining **99.5%** on-time delivery and optimized inventory performance
HOW THEY DID IT	Implemented multi-region VMI, warehousing, and late-stage kitting to streamline fulfillment and boost efficiency

RECLAIM

Environmental sustainability is under the microscope. Roughly 99 percent of the S&P 500 discloses sustainability information, including the standards and frameworks they've adopted and the progress they're making on greenhouse gas and net zero commitments.[9] With climate change a top-three priority for global C-suite business leaders — surpassing political uncertainty, competition for talent, and shifting regulations — companies are transforming their business models and strategies accordingly.[10]

Not only is that good for the planet, but environmental stewardship also pays dividends with customers, suppliers, and investors seeking to do business with like-minded organizations. From a fiscal standpoint it's good for the bottom line, too, as resale and responsible recycling create new revenue streams. Companies are turning to circular economy principles to minimize waste and maximize value recovery.

THE FLEX **ADVANTAGE**

Extending the product lifecycle with aftermarket services

Flex circular economy solutions extend product lifecycles, reduce waste, and recover value, helping brands meet sustainability goals, reduce risk, and unlock value at end of life.

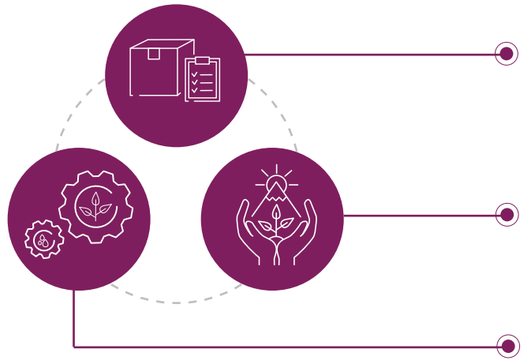
Reverse logistics and returns management
Turn post-sale complexity into competitive advantage and reduce environmental impact.

Repair, refurbishment, and reuse
Extend product life and unlock new value through recovery and remarketing.

Resale, recovery, and responsible recycling
Improve resource productivity while ensuring full compliance and traceability.

Digital circularity platforms
Quantify carbon savings, track recovery value, and strengthen your sustainability posture.

Close the circularity loop with Flex



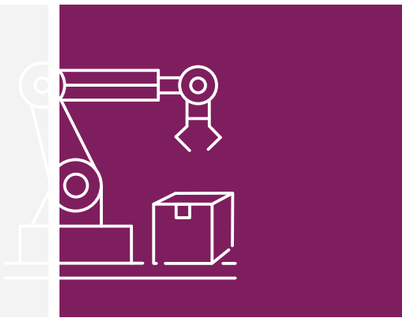
FreeFlow
Streamline remarketing efforts and profit from retail, returned, obsolete, or excess stock.

Flex ECO2
Quantify impact across returns, repair, refurbishment, resale, and recycling efforts.

Circale
Optimize reverse logistics to increase the residual value of products.

Strategy in action

COMPANY	Consumer products OEM
IMPACT	Doubled refurbishment output and recovered millions in value from returned floorcare products
HOW THEY DID IT	Established regional refurbishment centers and circular reuse programs across the U.S. and Europe to reduce waste



The right partner, in-region and around the world

FASTER EXECUTION AT SCALE
Advanced manufacturing and integrated fulfillment **move products to market quickly and simply.**

SUSTAINABLE OUTCOMES
Repair, reuse, and recycling reclaim value and cut CO_2 impact by up to **40%.**

PROVEN RESILIENCE
$184B in annual disruption costs highlight the need; Flex mitigates risk with sourcing, buffers, and visibility.

GLOBAL, IN-REGION REACH
30 countries, **16K** suppliers, and regional hubs cut lead times by up to **50%.**

End-to-end product lifecycle services

Designed for now. **Ready for what's next.**

With services that span the product lifecycle, Flex enables companies to thrive.

- Built for volatility, proven at scale – Flex services are designed to help customers adapt faster, manage disruption, and stay ahead in a volatile world.
- One partner, every phase – From design to return, Flex connects your product lifecycle with integrated services that add value and simplify execution.
- Smarter decisions, powered by data – Traceable programs and innovative digital tools give you the visibility to plan better, act faster, and measure impact.
- Speed, scale, and sustainability – Flex unifies agility, global execution, and circularity to help customers grow, launch, and reclaim with confidence.

Flex end-to-end product lifecycle services at a glance

DESIGN AND ENGINEERING

PRODUCT DESIGN
- Reference design
- Rapid prototyping
- New product introduction
- Reliability and failure analysis
- Microelectronics packaging
- Simulation and modeling
- Value engineering and analysis

DESIGN FOR EXCELLENCE
- Design for manufacturing
- Design for testing
- Design for automation

SUPPLY CHAIN

GLOBAL NETWORK
- 16K suppliers
- Preferred Supplier Program
- 7K+ supply chain professionals
- 1M component SKUs

SUPPLY CHAIN DESIGN AND DIGITIZATION
- Value chain modelling
- Joint risk management
- Flex Pulse real-time visibility and analytics

CUSTOMIZED COMPONENT SOLUTIONS
- Standard, semi-custom, and custom electrical and mechanical components
- Global component hubbing and logistics programs

ADVANCED MANUFACTURING

VERTICALLY INTEGRATED CAPABILITIES
- Advanced electronics assembly
- Sheet metal, racks, and enclosures
- Plastics and tooling
- Machining
- Integration and testing
- Subassembly and final assembly

ADVANCED MANUFACTURING TECHNOLOGIES
- Automation and robotics
- Digitization
- Simulation and digital twins

VALUE-ADDED FULFILLMENT AND LOGISTICS

FORWARD LOGISTICS AND FULFILLMENT
- Inventory management
- Warehousing
- Kitting and late customization
- Omnichannel fulfillment

AFTERMARKET SERVICES

REVERSE LOGISTICS AND CIRCULAR ECONOMY
- Sustainability analytics
- Returns and screening
- Repair
- Refurbishment
- Asset recovery
- Product and parts resale

Explore services that can enhance your business, end to end.

Learn more
Our product lifecycle services

Resources

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For more information, visit **flex.com/connect**

Flex (Reg. No. 199002645H) is the manufacturing partner of choice that helps a diverse customer base design and build products that improve the world. Through the collective strength of a global workforce across 30 countries and responsible, sustainable operations, Flex delivers technology innovation, supply chain, and manufacturing solutions to various industries and end markets.