
MRO 2025

The Future of
Digital Supply Chain
is Now





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INTRODUCTION

The **COVID-19 pandemic** highlighted the world's lack of readiness to manage through a global supply chain crisis and the need for digital supply chain management strategies that reduce our reliance on off-shore suppliers for crucial parts, components, and materials. While maintenance, repair, and operations supply (MRO) was a historically neglected area in many organizations, it has proven to be an essential supply chain during this global crisis, especially for continuity of supply of PPE materials, disinfectants, and critical asset spares.



The pandemic also acted as an **inflection point** for many of the trends that were already occurring in the MRO supply chain space previously:

- The **aging workforce**, particularly in the technical trades, and the resulting loss of intellectual property and tribal knowledge
- The **growing skills gap** as assets and manufacturing in general become more complex, sophisticated, and smarter
- The increased focus on **reliability** and asset **uptime**
- And the growing realization that the MRO supply chain **as a function** is essential to operations, that many of the materials that flow through this supply chain are mission critical (as in PPE and critical spares), and that this is a huge area of risk and vulnerability

And while the adoption of digital technologies was certainly accelerated by the pandemic, nobody seems to really be able to explain in a practical sense exactly what a digital MRO supply chain is. How do you recognize it? Why should you care?

This guide outlines:

- The limitations of legacy approaches to MRO
- The imperative driving digitization and automation in MRO supply chain
- The supply chain technologies and trends reshaping the MRO ecosystem
- Specific actions supply chain professionals can take to prepare for the future



A LEGACY OF LIMITATIONS

The MRO supply chain is evolving thanks in part to Industry 4.0. But while businesses spend a huge amount of time managing their direct supply, historically the MRO supply chain has been overlooked. It's not surprising though. **Maintenance, Repair and Operations (MRO)**, which can literally be nuts and bolts but also includes services and materials, typically is not viewed as an essential function, even though this supply chain is mission-critical – safety equipment, lubricants to keep production lines running, critical component parts that if missing could mean hundreds of thousands of dollars in machine downtime.

MRO is often neglected because there is no single owner. It **touches everyone** from procurement, to finance, to plant operations and maintenance, to risk management and information technology.

These are functional silos of pain, where each silo self-optimizes, sometimes at the expense of other stakeholders with competing and conflicting interests – which can be detrimental to the enterprise overall.

- **Engineering** wants the most reliable parts to optimize machine uptime, regardless of cost.
- **Maintenance** wants the maximum amount of inventory
- **Finance** wants the least amount of inventory as it impacts working capital
- **Procurement** wants the highest value for the lowest cost

And the very nature of it means a high-volume of low-dollar-value transactions. MRO and facilities spend is often under-addressed because they can be difficult to reach. Control is often decentralized, visibility is limited, and driving change can be really difficult.

As a result, this non-function is under-resourced in terms of people, process, and technology. Finding the data is virtually impossible because it resides in various ERP and CMMS systems. It's corrupt, incomplete, inaccurate, unstructured, and largely inactionable. And

systems are not integrated or able to pass data efficiently.

It seems easier to do nothing and maintain status quo than to address MRO.

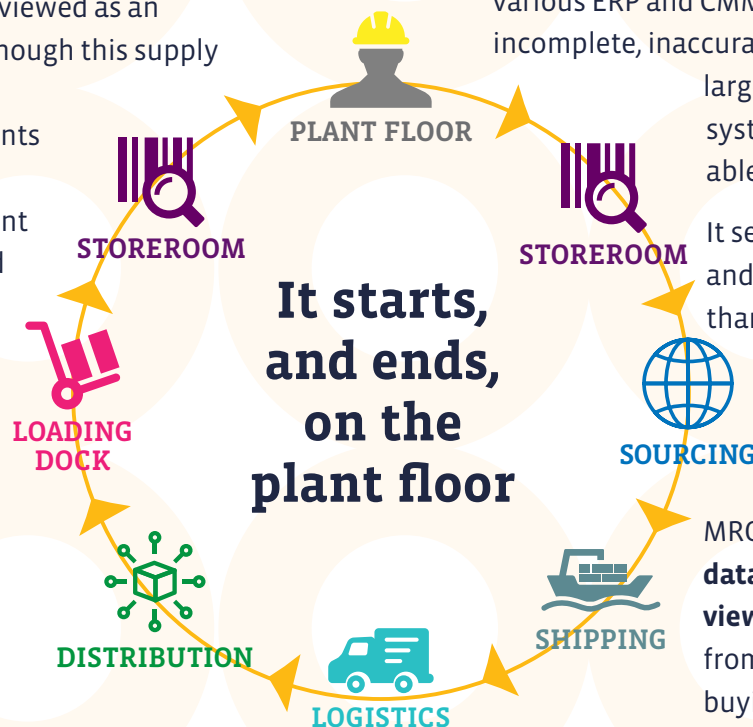
Any procurement organization would be hard-pressed to affect change and leverage their

MRO/PPE spend because the **data doesn't give them a clear view** of what they're buying, from whom, or why they're buying so much (or so little) of it. And if procurement can't

get access to the spend, they can't negotiate savings, leverage category expertise, or drive innovative solutions to help the organization become more successful.

To drive improvements in traditional MRO supply chains, companies need to invest in, develop, and implement advanced digital technologies and leverage a digital ecosystem of partners to become more adaptable and take their customers on the journey through the digital supply chain.

In a post-pandemic world, the status quo is no longer tenable.





THE IMPERATIVE FOR CHANGE

It's time to turn the corner.

The COVID-19 pandemic has accelerated the urgency in starting to **connect**, **digitize** and **automate** your MRO supply chain.

Disruptions in productions transportation, and logistics highlighted the importance of **redundant** supply sources, manufacturing **agility**, and data **accessibility**. Digitization & automation of the MRO supply chain is now a must. It's clearly not just innovation for the sake of innovating, there are real **practical implications** in maintaining the status quo:

- Labor shortages: both skilled and unskilled labor is scarce and is only going to get worse (especially for manufacturers)
- Risk mitigation
- Simplification
- Visibility
- Control
- Productivity
- Cost reduction – direct and indirect

→ Shift from legacy to a purpose-driven strategic lever to drive other initiatives including:

- » Asset management & reliability
- » Safety
- » Sustainability
- » Diversity

Manufacturing companies will need to be confident that they can obtain the MRO supplies and insights they need to match activities to demand and market dynamics.

Traditional demand signals no longer apply but **connected supply chains** can make sense of the data and help develop new systems to interpret it. This will lead to fuller understanding of inventory levels, production schedules, and the other crucial logistical components that can bring order to supply chains and guide decisions.





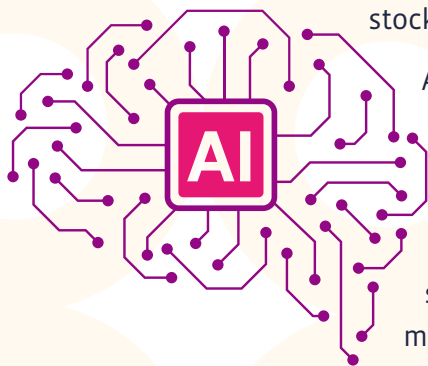
RESHAPING THE MRO ECOSYSTEM

So, what does a digitized and semi-automated MRO supply chain look like?

What are the emerging technologies that are impacting the MRO supply chain? Increased digitalization, driven by the rise in consumer expectation and empowered by the democratization of Industry 4.0 technologies, will result in a more resilient and agile MRO supply chain. Digital Supply Chain technologies will connect the supply chain ecosystem to **improve visibility and risk management and enable collaboration** by sharing real-time end-to-end information that enables supply chain professionals to pivot faster and, in some cases, predict changes in supply or demand.

AI and Machine Learning

Quickly and efficiently cleanse and enrich part data; inventory/demand forecasting; non-stock sourcing;



Artificial Intelligence is speeding the **sourcing, selection** and **transaction** process in MRO supply chain management. A highly transactional business,

MRO supply chain automation is supported by AI's self-learning. AI solutions can help automate various supply chain processes such as demand forecasting, connecting to production planning and enabling predictive maintenance.

Unifying data dynamically by layering real-time awareness over the historical picture, **Machine Learning (ML)** takes it one step further by using up-to-date information to trigger immediate action.

Historical data could include spend data on materials, service or labor costs, production/maintenance schedules, and previous consumption pattern data. Condition monitoring provides additional IoT sensor data that, when used with Machine Learning to detect maintenance patterns can predict failure and trigger immediate action. Machine Learning then would allow for **Predictive Maintenance with IoT** to be automated, creating a work order ticket for a technician to inspect an asset prior to failure. As ML is fed more data and the confidence rates improve, the parts for the repair could be ordered and delivered before the tech even arrives. Advanced Analytics when combined intelligently with ML drives insights to immediate action, enables better visibility into MRO supply chains, and provides customers greater control to better future-proof their businesses.

APIs

Plug-&-play system (ERP, CMMS, Suppliers, Freight Carriers) connectivity to seamlessly and safely share data among internal and external systems and stakeholder groups: Application Program Interface, both the vertical and horizontal integration of platforms, is not new technology, but the application is proliferating.



APIs are essentially a set of functions and procedures that allow applications to **access data and features of other applications**. They offer a true plug-&-play solution to integrate for secure and easy passage of data between systems, enabling customers to access cutting edge technology in real time, without having to start over or build it from scratch. We are now seeing more and more companies that are willing



to use open APIs to integrate platforms. Some MRO ordering apps utilize APIs in combination with RPA to connect with major shippers and LTL carriers – automating the status update process and triggering notifications to mobile technicians in the field when the parts they need are shipped, the expected delivery date, and when they’ve arrived. These types of notifications would then allow technicians to plan their maintenance work orders around the delivery schedules of the needed materials. APIs also allow for simple integrations between EAM and CMMS systems and between purchasing and ERP systems. This results in greater **transparency**, improved **efficiency**, elimination of **waste** in the process, and **speeding** the process.

Advanced Data Analytics

Leverage data (work order, procurement, inventory), derive actionable insights, and **improve decision-making**: In today’s digital

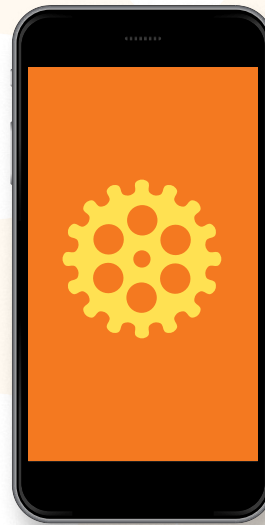
economy, data drives real-time agility, allowing organizations to respond to supply chain disruptions as they evolve.

Advanced analytics based on continuous intelligence from multiple datasets and real-time information establishes intelligent analytics pipelines that break down the silos inherent in MRO supply chains and allows for supply

chain optimization. Data analytics are increasingly being used in dynamic pricing and replenishment. A purpose-built MRO analytics tool can take any manner of data and use it to help sourcing specialists pinpoint where best to drive **efficiencies** in supplier consolidation, cost reduction, and productivity improvements.

Mobility

Extend systems functionality to the edge: Mobile applications have quickly become the norm, as



consumers have become accustomed to ease of use and access to information at the tap of a finger. B2B customers are no different. They want to be able to identify and order parts needed to repair and maintain their production lines, **without having to leave the shop floor** and walk to a storeroom window, desktop, or terminal. Great strides are being made in MRO supply chain mobile apps to give the

maintenance users an easier way to get the supply they need to do their jobs. Progressive facilities management and maintenance organizations are utilizing persona-based ordering apps with supplier call-in, will call, and buy online / pick up in store options available. These apps allow organizations to **track spend** while technicians benefit from real-time inventory availability incorporated via API. This allows them the convenience to call up any item in the app and know exactly **where it is inventoried** or the availability and pricing for ordering. More maintenance programs are beginning to integrate these types of mobile apps for the user-friendly interfaces, ease of navigation, B2C experience, and the ability to drive compliance to negotiated contracts, since the technicians no longer need to shop with p-cards.



eCommerce

Access and leverage the global market place, including legacy and local suppliers efficiently: Slow, imprecise, and prone to error, labor-



intensive, **paper-based** ordering and payment systems are notoriously hard to manage. Many transactions are non-contractual, leading to higher and unpredictable

prices. They often are decentralized, increasing the potential for over-ordering. Companies that invest in eCommerce solutions or partner with third-party providers that have developed eCommerce expertise can optimize the process, **minimizing input errors** that take time to reconcile and avoiding late payment costs. Online marketplaces and eCommerce solutions enable buyers to search for suppliers and shop for supplies in external B2B catalogs that aggregate multiple suppliers under a common front-end user interface while retaining visibility to the purchase and product type. This **streamlines the procurement process** and increases the number of transactions being influenced by procurement without sacrificing visibility and control.

Sourcing Automation

Integrate, automate, and digitize the way customers find, evaluate, work with, and transact with their suppliers. Organizations who make **procurement automation** a priority as part of an overall digital transformation strategy are able to leverage technologies like AI and RPA to manage spend in real-time, predict demand, and predict sources of future supply in addition to being able to run sourcing events faster. According to **The Hackett Group's 2019 report** on Smart Automation, digital technologies can improve productivity for procurement organizations by 33% while improving agility and overall effectiveness.

Automating the procurement and MRO supply chain process enables sourcing efficiency by **codifying processes** to ensure the lowest total cost of ownership, considering supply reliability, product quality, innovation, compliance, and other factors in addition to pricing. Establishing machine-driven sourcing decisions delivers quality and efficiency **no human could hope to achieve** for speed and transparency in ordering, forecasting, maintenance scheduling, and more. Combined with procurement automation, this means sourcing can improve response times, better leverage the market, enable secondary market sourcing, and increase RFQ effectiveness.





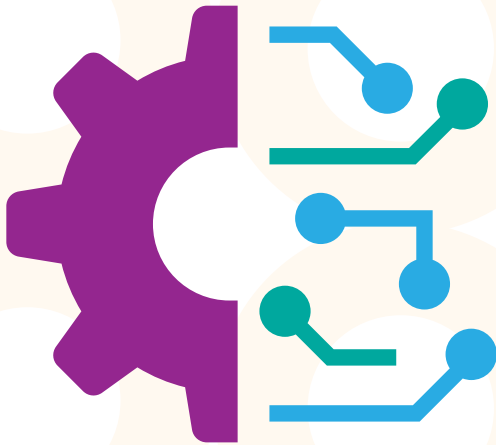
IoT

Advanced demand signaling and visibility to asset conditions, allows us to better align supply chain with maintenance plan. **The Internet of Things**

has advanced so rapidly, and costs are dropping so quickly, that it has become a ubiquitous technology. Almost any single asset can be monitored at all times. Having that visibility into one asset in advance will

predict (and prevent) failure and allow for better planning in the MRO supply chain.

While this level of connectivity is not as common in a complete end-to-end supply chain process, the IoT for MRO sits at the intersection of enterprise asset management and supply chain management. This means customers have the **parts available** and the ability to intercede before it becomes a catastrophic loss. It also translates into improved asset utilization and higher uptime, greater customer focus, better end-to-end supply chain performance, superior supply availability, superior visibility, and improved reliability.

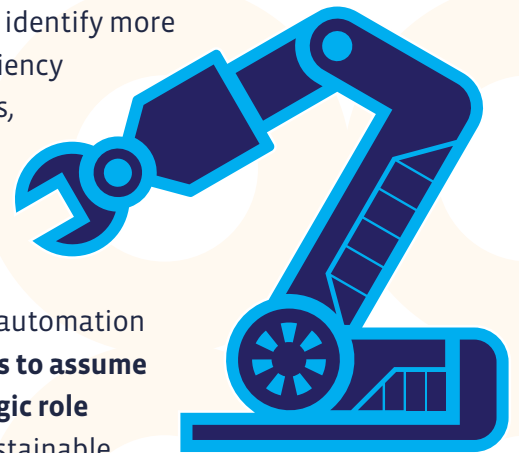


Robotic Process Automation (RPA)

Reduce back-office costs and shift focus to strategic supply chain management. Robotic process automation is a fundamental strategy for procurement organizations because it **reduces the non-value-added time** that procurement professionals spend on tactical execution. This allows them to focus on more strategic initiatives. The strengths in MRO supply chain management – deep category expertise, market insight and integrated processes – are enhanced by robotic process automation. RPA tools **cut costs, eliminate keying errors, speed up processes** and **link applications**. It has proven to be very effective in simple use cases where third-party automated data integration poses a challenge. RPA can also be applied to data normalization and enrichment, streamlining and reducing the cost of master data management.


Robotic process automation enables procurement teams to get more spend under management, identify more areas for efficiency improvements, and drive compliance to sourcing strategies.

Procurement automation **enables teams to assume a more strategic role** in creating sustainable value and can provide organizations with a real competitive advantage.





Last-Yard Logistics & Inventory Security



Full end to end transparency with point-of-use vending, secured lockers, and automated unmanned storerooms: Any supply chain involves various parties from one end to the other. For MRO, it's thousands of suppliers in such a fragmented supply chain that **traceability, automation, and security** are virtually impossible without a digital supply chain. Innovative technologies such as blockchain, intelligent lockers, point-of-use vending systems, and optically-enabled unmanned storerooms can significantly impact and shift the very nature of the MRO supply chain. **The ultimate in last yard fulfillment**, these technologies ensure line workers and maintenance techs can access the consumables, protective equipment, and supplies they need near their work locations. They offer the added benefit of tracking material use by individual, department, and project, lending important insights into productivity and efficiency and inventory control.

Additive Manufacturing

Part re-creation for aged assets where parts are no longer commercially available. Additive manufacturing (**3D printing**) enabled by 3D scanning is allowing the re-engineering of otherwise obsolete parts to extend the life of production assets.



This technology is having a disruptive and transformative effect, because you could theoretically **eliminate or minimize huge amounts of inventory and lead times** and make the parts on-demand. 3D scanning enables the capture of a digital version which can be reverse engineered or re-engineered and then printed in hours. No expediting fees. No delivery fees. Usage has evolved beyond prototyping and is growing, as the technology has advanced so rapidly companies can now print at **OEM production capacity** – as fast as most other mainstream manufacturing processes with metal.



PREPARING FOR THE FUTURE

The MRO digital supply chain of 2025 promises greater visibility and transparency but depends greatly on an organization's **willingness to be flexible** and open to innovation.

Only a culture of entrepreneurship or intrapreneurship within a larger organization will drive this shift. It means continuously looking for new and better ways and staying curious. To always find

new and better ways, not just as a way to focus on the customer and to push results, but as a way to **collaborate** and fulfill a natural curiosity and drive to learn.

Think big.

Have that future vision in mind. What does the digital journey look like in three years? In five years?

Start small.

Don't get overwhelmed or paralyzed by the long-term vision. Find a small project and get those small wins under your belt to build confidence and momentum.

And scale fast.

Take those wins and repeat them for bigger projects for long term gains. As in any revolution, you will try things and fail. But with the pace of technology changing so rapidly, you want to fail fast. Fail. Fail fast. Learn from it and keep moving forward.

The MRO supply chain of 2025 will mirror the higher purpose of today's rising supply chain leaders – not just in what is being delivered, but **how and for whom**. Purpose-driven supply chains take proactive steps to regenerate lost natural capital, taking action and influencing those in the ecosystem to follow their lead.

It's a journey, not a destination.

ABOUT THE AUTHOR

Jim Owens is a member of the Advisory Board for **Penn State's Center for Supply Chain Research (CSCR)**, a member of the Technology Advisory Board for **ConnexFM**, and Chief Growth Officer at **SDI**, the leader in Digital Supply Chain Services and Solutions for MRO/PPE. Contributing author on the published *Supply Chain Management Review* article, **The Longest Yard, and The Last Yard** research featured in the 2019 3PL Study, Jim brings a unique blend of strategic and creative thought to every engagement to foster an environment of proactive collaboration and shared value for clients and partners alike.



Owens has a passion that drives him to develop innovative ideas and strategies to help clients solve their toughest challenges. With a history of commercial and industrial business development for companies like **EMCOR, Transfield Services, and IFCO**, Owens' experience at creating and implementing successful and strategic value-driven solutions transcends industry sectors.



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