MRO Evolution: Part 1
Overview of Management Practices and the Role of Outsourcing

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About Our Research

MRO that has long been viewed as low-impact, low-dollar expenditures is increasingly recognized as an opportunity for the indirect value chain to lower costs and enable operational performance. Leading companies are now shifting away from the back-office management mentality to integrated MRO management that facilitates operational excellence, while optimizing total cost of ownerships. This research aims to shed lights on the current state of this MRO management evolution, and management approaches implemented across various activities in the MRO value chain.

In the part I of the MRO evolution whitepaper series, insights drawn from literature and interviews with MRO and indirect spend subject matter experts are presented in terms of how MRO management practices are evolving, and the changing landscape of third-party service providers amid this development.
Introduction

MROs are at the heart of the indirect supply chain and play an important role in enabling business professionals to impact enterprise goals such as reliable manufacturing processes (e.g. low plant downtime and high operation productivity), better management of their asset base, risk mitigation, cost reduction, and value creation [1]. A number of trends contribute to the importance of effective MRO management.

MRO spend as a percentage of overall material spend is growing.

The MRO category has steadily grown to account for a larger percentage of total procurement expenditure as we observe continued increases in automation and complexity of capital equipment that necessitate a higher degree of repairs and maintenance. For a standard organization, MRO spend is estimated to represent nearly 10 percent of total procurement spend. The manufacturing, consumer packaged goods (CPG), and retail industries that tend to have a higher degree of MRO spend compared to other industries could hold around 15–20 percent of an organization’s expenditure [2]. These figures have as much as doubled compared to those 20 years ago when we saw average MRO costs as a percentage of total indirect spend at 3–12 percent, depending on the industry.

MRO process-related costs are disproportionately high in relation to piece prices.

Looking beyond piece prices into total cost of ownerships, about 25–40 percent of the total cost for most MRO items and services pertains to the acquisition costs, while the other 60–75 percent comprises operating, training, maintenance, warehousing, environmental, quality, transportation costs, and the cost to salvage the products (if any) [3]. The high acquisition costs are, to the large extent, a result of MRO’s highly transactional procurement processes. Indeed, for MRO spend that typically represents about 15–20 percent of a company’s purchasing activity by value, it could make up 70–90 percent of purchase order volume [4].

MRO management has significant impacts on operational performance.

MRO supply chain performance and the reliability of associated assets is critical element of operational excellence for asset-intensive companies [5]. Companies with poorly managed MROs suffer a host of other

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1 SDI 2015a; Sutherland and Snowdon 2015b
2 Gupta and Menon 2012; Sen 2014
3 Venkatraman 2014
4 MarginPoint 2014; RS 2014
5 Ferguson 2014
extra costs and inefficiencies beyond its own spends and acquisition costs. Significant costs occur due to unnecessary inventory of unwanted spares, and part duplication and obsolescence. Meanwhile, inadequate stock of required spares and consumables could create supply disruption, resulting in various indirect losses, such as additional labor cost due to unplanned shutdown and/or overtime, and scraps and defected products. Poorly managed MROs also create indirect costs associated with unsuitable use of highly paid maintenance technicians’ time and skills in searching parts catalogs, getting quotes from suppliers, and tracking deliveries rather than in repairs and planned maintenance activities. All of these costs and inefficiencies drive up capital and operating costs [6].

Essentially, the opportunity to realize significant cost savings and operational performance enhancement presented by MRO management is increasingly recognized. Leading companies are shifting away from the back-office MRO management mentality and evolving into integrated MRO management that facilitates operational excellence, while optimizing total cost of ownerships.

Inherent Complexities of MRO Management

Incomplete data, expansive supplier base, lack of demand visibility, frequent unanticipated purchases, and significant excess, obsolete, and dormant inventory—these are some of common ailments plaguing companies when it comes to MRO. To a certain extent, these challenges are results of complexities inherent in MRO and the value chain, notably the wide variety of MRO items, sporadic demand, and cross-boundary spanning processes.

A broad array of SKUs falls under the MRO category.

Copious number of items fall under MRO category, often including items that are of lower volume and broader variety compared to the raw materials, subassemblies and parts that directly go into a product [7]. MRO items can range from tooling and spares, MRO material, safety equipment, facilities management supplies and office supplies, to name a few [8]. It is reported that a Fortune 100

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6 Donnelly 2013; Sen 2014; Ward 2014
7 MH&L and Penton n.d.
8 Brammer 2010; GEP 2011; MarginPoint 2014; SDI 2015b
manufacturing operation may require 25,000 to 50,000 unique MRO SKUs that vary greatly in volume and value, many of which are used only on certain equipment [9].

**MRO demand is sporadic in nature.**

The MRO demand is sporadic in nature, involving low-value, but high-volume items intermingling with high-value, but low-volume specialized items. Such demand characteristics are in contrast to the dependent demand for direct materials, which is finite and well defined through the combination of the company’s production schedule and its bills of material (BOM) [10].

The erratic demand patterns of MROs lead to excess inventory hold to avoid potential shortages, and purchasing process that is complex, very time consuming, and highly transactional [11]. To put in perspective, each $1.0 million in MRO spend could create approximately 3,500 purchase order cycles (issues, receipts, POs, invoices) relating to MRO [12]. Consequently, processing a purchase order, receiving the goods, and paying the invoice to hundreds of suppliers often cost more than the price of MRO items [13].

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**MRO management spans across multiple stakeholder groups.**

MRO management spans across the ambit of MRO value chain as conceptualized in Figure 1.

Key processes of MRO management consists of identifying, sourcing, procuring, storing, record keeping, and issuing the items to support operations activities. MRO management also pertains coordination of such MRO services as outsourced procure-to-pay (P2P) processes, storeroom operations, inventory management, and reliability. The companies’ maintenance strategies, demand planning and forecasting, IT infrastructure and applications, and data governance are part of the strategic MRO processes and support infrastructure.

Thus, a typical landscape of MRO stakeholders encompasses sourcing and procurement, engineering, materials management, IT, operations, storeroom and warehousing, and maintenance and repair (M&R) [14]. Each of these stakeholder groups manages MRO according to its own set of processes, approvals, budgets, and priorities that often lack harmony as a whole value chain. For instance, MRO sourcing and procurement often emphasizes reducing spend and transaction costs, compliance, and supplier performance, rather than on inventory balances, and asset and operational

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9 GEP 2011
10 MarginPoint 2014
11 The Manufacturer 2011; RS 2014; SDI 2015b; Sutherland and Snowdon 2015a
12 Krauter 2014
13 Gettinger 2013; MarginPoint 2014
14 Ferguson 2014; GEP 2011; Lewis 2015; SDI n.d.; Vashistha and Srivastava 2011
performance [15]. On the other hand, MRO users like plant engineers and maintenance staff are typically responsible for workforce productivity and the execution of an asset performance management, thus they focus on part availability, rather than on requisition processes and transaction costs. Meanwhile, storeroom and warehousing managers focus on optimizing MRO inventory investment while ensuring that the correct parts are in inventory and in service-ready condition [16].

The MRO inherent complexities notwithstanding, too often, existing MRO management practices aggravate, rather than alleviate, the situation.

Figure 1 | MRO Value Chain

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15 Ferguson 2014; Sutherland and Snowdon 2015b
16 Ferguson 2014; Ladner 2014; Venkatraman 2014
The Quandary of Traditional MRO Management Practices

Thus far, typical MRO management practices are characterized by fragmented decisions made by multiple decision makers who manage MRO independently with little communication among them. They also rely on data essential to forecasting and planning that are collected and stored in siloed systems without a unified data maintenance and governance strategy in place. Because of this functional silo, none of the involved parties has a full view of MRO value chain, resulting in management practices that is well-intended, but suboptimal.

Moreover, MRO has been viewed and managed as a non-core category. There are limited standardized processes in place to manage MRO (e.g. how they are purchased, stocked, consumed, analyzed), limited focus on performance measurement, and limited investment in both talent and information technology.

Repercussions of these traditional MRO management practices manifest themselves in many areas of MRO value chain—substantial MRO procurement process cost (e.g. spot buy, expensive expedite shipment), duplication of stockholding with working capital being unnecessarily tied up in inventory, and poor data resulting in ineffective planning and forecasting, and demand management, to name a few [17].

Impacts of decentralized sourcing and MRO as non-core category mindset

MRO sourcing activities encompass spend data management to identify and classify the MRO spend, strategic sourcing of high value MRO items, total spend management, spot buying, category management, market intelligence, spend and source compliance, contracting, and vendor management [18].

Traditional management approach of MRO sourcing tends to be highly decentralized, resulting in situations where sourcing practices for the same type of supplies often differ between departments and facilities. MRO is also viewed as a tactical, non-core category that is managed with limited or no controlled list of approved vendors. Rather the wide array of MRO items is sourced from several different suppliers, often including local vendors at each site, and managed at a local or site level rather than corporate procurement. Such a fragmented supplier base of varying pricing practices, delivery methods, and customer services makes it difficult for companies to achieve leveraged

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17 Brammer 2010; GEP 2011; RS 2014; SDI 2015b; Terfehr 2009

18 Accenture 2013; Gupta and Menon 2012; Wolseley Industrial Group 2015
pricing, timely delivery, and customer service quality [19].

Moreover, given the non-core category mindset, MRO spend analysis and supplier performance evaluation is rarely performed. The spend analysis typically involves extracting invoice data from the organizations accounts payable system(s) to identify MRO suppliers and segment them by site and category, along with information gained from supplier performance evaluation (e.g. service and product quality, lead-time reliability). Not undertaking these examinations, companies with traditional MRO operations tend to lack insights into MRO categories that could offer total cost of ownership (TCO) savings opportunities, such as through supply base rationalization, part standardization, and shortlisting of approved and controlled suppliers [20].

**Impacts of non-standardized Procure-to-pay (P2P) processes, and limited compliance and spend tracking.**

Procure-to-pay (P2P) processes for MRO spend include approvals and requisition management, compliance management, PO processing, day-to-day purchasing, catalog management, and trouble shooting and expediting of orders [21].

Traditional P2P processes for MRO are, in many cases, characterized by non-standardized processes across units, limited compliance and spend tracking. As a result, traditional MRO companies have been enduring low percentage spend under contract, low spend visibility, high degree of unaccounted or maverick spend, and a disproportionate amount of time and acquisition costs spent for MRO items that are of relatively small value. In fact, acquisition cost can account for as much as 25–40 percent of the total cost for most items and services [22].

**Impacts of poor master data management and underinvestment in information systems and technology.**

Under the traditional MRO management approach, master data management is meager because IT resource necessary to create a unified data repository is typically underutilized or scarcely exists. Instead, critical asset data are collected and stored in siloed systems (like spreadsheets and isolated databases), with no linkages to other related enterprise business software systems, such as Enterprise Asset Management (EAM) systems, Enterprise Resource Management (ERP), and Computerized Maintenance Management Systems (CMMS) [23].

Furthermore, there is poorly defined, or no standard classification taxonomy, no common format for part numbering, and no data governance practices for the creation, use, access, and maintenance of data across the organization. In these instances, companies struggle with problems of massive

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19 Brammer 2010; GEP 2011; Gupta and Menon 2012; MarginPoint 2014; SDI 2015b
20 GEP 2011; Sen 2014
21 Gupta and Menon 2012
22 Gettinger 2013; Gupta and Menon 2012; Krauter 2014; RS 2014; Venkatraman 2014
23 Ferguson 2014
duplication of records, misclassification, inconsistency, and inaccuracy [24].

Without unified data repository, standardized MRO catalog, and established data governance to create standardized, complete, and accurate data, companies are unable to accurately read MRO consumption patterns from an enterprise level, perform KPI analysis and reporting, create accurate demand forecast and meaningful schedules for MRO spend, and avoid or reduce unnecessary emergency order and inventory [25].

**Impacts of fusty inventory management practices, inadequate inventory analysis, and inattention to control procedures.**

Inventory management and storeroom operations are among key MRO inventory activities—the former involves inventory analysis and planning, while the latter entails receiving and handling process definition, inventory guidelines, and warehouse operations [26].

Traditional MRO companies tend to employ fusty inventory management practices—such as adding all of the manufacturers recommended spare parts list to inventory, and buying in bulk for price discounts—with limited analysis of MRO inventory characteristics and requirements to understand usage patterns, reorder point, and lead times, etc. [27] Consequently, companies missed out on the opportunity for cost savings, e.g. through the removal of duplicate items, and reduction of excess, slow-moving, obsolete inventory [28].

Moreover, different systems tend to be used at different plants with no way to share common information such as types of spare parts used and availability at individual plants [29]. Nor is there data governance in place. Thus, most users either do not enter the data or enter using basic free form text on work orders, leaving companies without the ability to track specific part origin, failures, usage, etc. for strategic work order planning [30].

Adding further to the conundrum, processes for inventory control (e.g. cycle counting) and tracking (e.g. when they are received, stored, and decremented as they are used) are not established in storeroom operations. MRO inventory is also very rarely measured in terms of inventory on-hand, turns, obsolescence, or usage [31].

The archaic inventory management practices, inadequate inventory analysis, and inattention to control procedures have long resulted in the lack of MRO inventory visibility that make it difficult to perform KPI analysis, and determine when MRO materials need to be replenished [32].

As a result, a host of negative symptoms ensue, such as inability to locate parts despite their availability; over consumption as workers consume material with little accountability; the practices of

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24 Agrawal 2012; Brammer 2010; IHS 2013; Paquin 2014
25 Gupta and Menon 2012; IHS 2013; Lewis 2015; Paquin 2014; Smith 2015; Zynapse 2011
26 Accenture 2013; Gupta and Menon 2012
27 GEP 2015; SDI 2015b
28 GEP 2015; Ingalls 2015
29 Ferguson 2014
30 IHS 2013
31 Donnelly 2013
32 IHS 2013; MarginPoint 2014
“hidden” or “private” inventories; spot buys or unplanned purchases for items not set up in inventory; lack of plant-to-plant inventory transfer capability; and both excess inventory and obsolescence growth [33].

To put the foregoing chaos in perspective, analysts estimate that 40–60 percent of all MRO inventory in a manufacturing company is usually excess, obsolete, or infrequently used critical spare parts [34]. Equally, another industry experts’ estimate suggests that MRO inventories are growing at 9 percent per year, despite the fact that 55 percent of MRO inventories have not moved in the past three years, and 30 percent of MRO inventories that are currently in stock will never be used [35].

In summary, companies do not bode well, both in terms of costs and operational impacts, from abiding by the traditional MRO management approaches. However, in recent years, faced with rising pressure to cut costs and do more with their existing resources, increasing number of companies are beginning to view MRO in a new light. They recognize that, if done right, they can turn MRO from a headache into an operational excellence enabler that contributes to overall revenue and profitability. The evolution of more sophisticated MRO tools and technologies (e.g. integrated software, analytics, and KPI dashboards) further provides companies with the new opportunity to effectuate the improvements in the MRO frontiers.

Towards Integrated MRO Management

Leading companies are shifting to integrated MRO management approaches that see and manage MRO as a value chain. Emphases are placed on process standardization, end-to-end alignment, reliability performance, performance evaluation, and data-driven and intelligent-based decisions and planning.

Table 1 highlights characteristics of management approaches implemented in the seven elements of the MRO value chain that reflect the key distinctions between traditional and integrated management approaches. Strategic features of note are the followings:

- **Decisions based on return on investment (ROI) and total cost of ownerships (TCO)** that consider the entire process of procuring and

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33 Brammer 2010; Donnelly 2013; Ferguson 2014; GEP 2015; HIS 2013; MarginPoint 2014; Sen 2014

34 GEP 2015

35 IHS 2013
consuming the product or service, rather than just purchase prices [36].

- **Investment in IT infrastructure and software solutions** that streamlines and/or automates processes, and enables part rationalization (part data management, part classification, technical data enrichment, technical reference guide creation); parts identification (MRO catalogue); central data warehouse; decision supports and business intelligence (advanced analytics, stock prediction techniques, inventory segmentation); inventory transfer capability; and performance measurements (supplier scorecard, KPI dashboard and reporting)—all in a standardized and centralized fashion [37].

- **Unified governance policies** that provide control over processes and methods used in executing MRO activities (procurement, inventory control and transfer/allocation, and storeroom operations) and in gathering and using data (classification taxonomy, part numbering format) [38].

- **Reliability performance orientation** that accentuates proactive maintenance, in-depth analysis of asset reliability, and collaboration between maintenance crew and storeroom/warehouse team [39].

In their endeavors to achieve integrated MRO management, companies require the right talent with MRO process and category expertise as well as information technology investment to enable standardization of processes, data and intelligence management, and performance assessment for continuous improvement.

Companies are at various stages of MRO management evolution and embrace a varying degree of in-house and outsourcing depending on their focuses and internal capabilities.

Those possessing the resources and management know-how have developed MRO management into in-house competitive advantages; while others with humbler resources and skill sets have found outsourcing to a third-party service provider to be an attractive solution. In the latter cases, the extent of outsourcing varies, with some characterized as piece-meal approaches involving sourcing through aggregators, Vendor-Managed Inventory (VMI), and Procure-to-Pay (P2P) outsourcing; while others can be described as end-to-end comprehensive outsourcing that spans across the MRO value chain [40].

In the next section, we highlight the changing landscape of MRO service providers as driven by the role of outsourcing in the transition to integrated MRO management approach.

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36 Varghese 2013; Venkatraman 2014
37 Accenture 2013; Ferguson 2014; GEP 2015; Ismail and Paquin 2013; Paquin 2014; Sikich 2013; Sutherland and Snowdon 2015b; Wolseley Industrial Group 2015
38 GEP 2015; Supply & Demand Chain Executive 2014
39 GEP 2015; Venkatraman 2014; Ward 2014
40 Gupta and Menon 2012
### Table 1 | Key Characteristics of Traditional and Integrated MRO Management Approaches

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<tr>
<th>MRO Value Chain Elements</th>
<th>Traditional Approach</th>
<th>Integrated Approach</th>
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| **Management mentality and scope** | - MRO as non-core category  
- Business unit/site-specific processes | - MRO as enablers of operational performance and cost efficiency  
- End-to-end value chain/enterprise-wide processes |
| **Requirement planning and forecasting** | - Planning based on limited analysis of inventory characteristics and requirements  
- Inventory planning with limited alignment with maintenance and operation objectives  
- Heavy reliance on OEM manufacturers for parts availability | - Data-driven, predictive planning based on detailed analysis of inventory characteristics and requirements (e.g. equipment Bill of Material (EBOM), Mean Time Between Failure (MTBF) data, the equipment maintenance plan data)  
- Inventory planning aligned with maintenance and operation objectives |
| **Sourcing** | - Price-focused sourcing approaches  
- Fragmented supplier base of varying pricing practices, delivery methods, and customer service  
- Limited or incomprehensive spend analysis and supplier performance scorecard  
- Limited focus on measuring and monitoring compliance in the existing MRO processes (e.g. pricing, rogue spend) | - Strategic sourcing approach, focusing on total cost of ownership  
- Optimal supply base with limited and controlled list of approved vendors  
- Strategies devised based on comprehensive spend analysis, supply segmentation, and supplier performance scorecard  
- Large percentage of the MRO spend monitored for compliance |
| **Procure-to-pay (P2P) processes** | - No standardized processes across individual business units and sites  
- Limited use or standalone use of e-business tools  
- Limited order tracking capability, with high degree of maverick spending | - Standardized processes across individual business units and sites  
- Use of e-business tools that are integrated with systems used by storeroom operations, M&R operations, and MRO vendors/service providers.  
- Order tracking capability, with mismatch resolution and cash reconciliation procedures |
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<th>MRO Value Chain Elements</th>
<th>Traditional Approach</th>
<th>Integrated Approach</th>
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<tr>
<td><strong>Inventory planning and strategies</strong></td>
<td>Limited use of inventory segmentation analysis (e.g. by consumption rate, ABC, and criticality) in devising strategies</td>
<td>Inventory deployment and replenishment strategies devised for different MRO based on inventory characteristics and segmentation analysis</td>
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<td>Limited focus on inventory performance tracking</td>
<td>Use scorecard of performance metrics (e.g. stock-out frequency, fulfillment rate, and percent of inactive inventory)</td>
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<td>Limited plant-to-plant/facility-to-facility inventory transfer capability</td>
<td>Balanced focuses on optimizing inventory held at site, and on standardization of key products and technologies throughout the plant.</td>
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<tr>
<td></td>
<td></td>
<td>Plant-to-plant/facility-to-facility inventory transfer capability</td>
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<tr>
<td><strong>Storeroom operations</strong></td>
<td>Limited data control on receipt, issue, stock and shelf life</td>
<td>Standardized policies and procedures used to document material requisitioning, replenishment processes, and inventory ownership</td>
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<td></td>
<td>No standard work process; supplies issued in an ad-hoc fashion, with little to no accountability, tracking of material consumption, and cycle counting</td>
<td>Standardized work process from item receipt at the receiving dock to item issuance to end users</td>
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<td>Reactive replenishment strategies, with min-max approach most commonly used</td>
<td>Materials routinely profiled to ensure alignment with consumption of key components, and actively checked (cycle counted) to identify discrepancies in inventory levels and correct inventory quantities before items being requisitioned.</td>
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<td></td>
<td>Limited technology investment</td>
<td>Investment in technology to support storeroom operations, inventory control, warranty tracking, and replenishment, while enabling accurate performance tracking and reporting</td>
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<td>Limited collaboration with M&amp;R operations</td>
<td>Close collaboration with M&amp;R operations, with common uses of pre-prepared work order kitting.</td>
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<td>MRO Value Chain Elements</td>
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| **Maintenance and repair (M&R) operations** | - Reactive maintenance methods, typically not based on detailed analysis of failure data or lead time consideration  
- Limited collaboration with storeroom operations | - Predictive/Proactive/Reliability centered maintenance (RCM) based on detailed analysis of both historical information (e.g. prior failures, usage, wear) and real-time asset condition readings (e.g. vibration analysis, corona detection)  
- Close collaboration with storeroom operations |
| **IT infrastructure and software solutions** | - Limited investment in MRO data management (MDM) technology  
- Siloed MRO data system with limited integration with existing legacy systems (ERP/EAM/CMMS), applications, and across individual business units and sites  
- Limited use of business intelligence tools | - Investment in best-in-class MDM system to create a single, accurate, and authoritative source of information.  
- Investment in IT resources that seamlessly establish linkage between the unified master data and legacy systems, applications, and across individual business units and sites  
- Investment in business intelligence tools to supplement MDM system with analytics, and KPI tracking and reporting capabilities. |
| **Data management and governance** | - Decentralized master data management, with incomprehensive and/or non-unified governance model  
- Asset data collected and stored in fragmented systems (e.g. spreadsheets and isolated databases)  
- MRO master catalogs created in siloed systems and without standard taxonomy for item description and classification | - Integrated master data management with comprehensive, unified governance model  
- Asset data collected and stored in a centralized data warehouse established as the engine accessible to all business units and sites for data analysis, performance tracking, and decision supports  
- MRO master catalogs and centralized MRO catalog system developed for enterprise-wide use, leveraging industry-standard taxonomies, tools, and knowledge bases |
The Changing Landscape of Third-Party MRO Service Providers

A notable trend amid the evolution towards integrated MRO management is the varieties of players that emerge under the “MRO integrator” umbrella of third-party MRO (3PMRO) service providers. They can be primarily classified into four categories, including: (1) distributor integrators, (2) third-party procurement integrators, (3) facility operations and maintenance (O&M) integrators, and (4) integrated MRO service providers. We provide brief discussion of these MRO integrators as the followings.

Distributor Integrators

MRO distributors are evolving as integrators that not only supply their products, but also serve as the purchasing agent for other products on behalf of the industrial end user, as well as provide value-added services [41].

Over the last four years, large distributors who provide multiple brands and categories of MRO items have been increasingly focusing on enabling their customers to purchase goods through their online e-procurement platforms, thus, enabling MRO buyers to consolidate their current suppliers. Full-line industrial distribution is becoming the norm among large-scale players. In fact, large distributors now make as much as $2 billion annually through their e-procurement platforms [42].

For MRO buyers, distributor integrators allow them to issue a single purchase order (PO) for many types of products, and receive a single invoice from the integrator for all the services and products provided. MRO spend, thus, can be aggregated through a single source, while reducing the complexity of MRO procurement and accounting activities [43].

Third-Party Procurement Integrators

Third-party procurement integrators act as aggregated buying agencies on behalf of their customer, without making or taking title to MRO items procured. In other words, they represent an outsourced purchasing function for the industrial end-user, performing the entire process of purchasing MRO on the client’s behalf—from ordering product, managing inventories, and paying for goods. Companies using third-party procurement integrators expect to see value in areas such as: (1) integrated sourcing of multiple product types, (2) reduce overheads in the form of labor, time and related procurement expenses, (3) aggregated buying requirements to achieve lower per-piece price in the market, and (4) equivalent bulk quantity discounts for smaller order sizes [44].

E-procurement is a key tools used by integrators in this category. They differ

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41 Exel 2009; MacInnes and Pearce 2003; Sudalaikannan 2014; Tompkins International 2013
42 Tompkins International 2013; Varghese 2015
43 Exel 2009; MacInnes and Pearce 2003
44 Gupta and Menon 2012; Kant 2012; MacInnes and Pearce 2003; Payne 2011
from traditional B2B MRO marketplace players in that their service offerings span beyond basic services (e.g. search a catalog, find, and buy an MRO product), to include more advanced and integrated services (e.g. strategic sourcing, contract management, auction and reverse auction services, e-collaboration, invoice management, supplier integration, and product visibility) [45]. Some examples classified by service orientations are the followings [46].

- **Procurement process automation (e-procurement).** ProcureNet.com, SourceAlliance.com, iProcure.com, Orderzone.com & Works.com, Ebuyxpress.com, MROnly.com, FindMRO.com
- **Inventory management.** MROnly.com, SourceAlliance.com
- **Volume purchasing.** Orderzone.com & Works.com

A notable trend in the e-procurement space are the move from on-premise solutions to a cloud-based delivery model where software and associated data are centrally hosted on the cloud. This new model increases software flexibility without additional investment in infrastructure [47].

The use of e-procurement tools enables MRO buyers to automate the complete P2P process, reduce the transaction processing costs as well as the need to process multiple PO’s, while achieving real-time pricing intelligence. The other major advantages of automating PO’s are better spend visibility and faster payment processes enhancing supplier relationships. Further inventory management advantages can also be gained when MRO buyers link inventory levels and usage to the ordering system of the suppliers [48].

### Facility Operations and Maintenance (O&M) Integrator

Facility operations and maintenance (O&M) integrators are service providers that serve asset owners by performing both maintenance and stock management. Typically operating under service level agreements, O&M integrators are tasked with improving asset availability and reliability. Their client base has traditionally been manufacturers or operators of complex machines (e.g. commercial airlines or mining equipment) due to millions of dollars spent each year on spare parts and the criticality of their uptime. More recently, however, distributors are joining their client base as they are investing heavily in automation and competing on customer service (e.g. next-day and same-day delivery)—the high-performance environment where any downtime can be costly [49].

O&M integrators have a distinct advantage over most other MRO integrators in that they address both the demand and supply characteristics of the asset lifecycle. On the demand side, over the past five years, improved diagnostic tools have enabled the

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45 Carmel 2000; MacInnes and Pearce 2003; The Manufacturer 2011; Varghese 2015
46 Carmel 2000
47 Varghese 2015
48 Gupta and Menon 2012; Mascarenhas 2015
49 Lewis 2015
proliferation of preventive and predictive maintenance services [50]. On the supply side, VMI approach, including industrial vending, that has become more accurate, automated, and remotely managed to share in-stock levels, forecasts, and point-of-sale/use data is increasingly deployed [51].

### Integrated MRO Service Providers

Unlike the other service providers discussed above that address specific elements within MRO value chain, integrated MRO service providers act as third parties who take the needs of the entire organization into account and provides an end-to-end solutions pertaining to MRO value chain. Some of well-known companies in this category are Strategic Distribution, Inc. (SDI), Storeroom Solutions, and Wolseley Industrial Group.

Depending on the scope of the outsourcing agreement, the integrated MRO service providers can provide the full range of MRO management services—from planning and forecasting, sourcing of the material, day-to-day transaction processing, logistics services, invoice processing and payment of suppliers, storeroom solutions, inventory management (VMI, vending machines), round-the-clock technical support, data management, category and product management portfolio, reporting, technology solutions (e.g. for improved order and inventory accuracy and tracking, and better spend visibility), to engineering design support, among others [52].

Integrated MRO service providers are evolving to become As-a-Service MRO providers as they continue to drive advancements in technology from on-premise systems to platform as a service (PaaS) and software as a service solutions (SaaS). This new commercial model is powered by new technologies and capabilities, notably better analytics and risk management that help the service providers add value [53].

Concurrently, successful service providers focus on developing a strong supplier base, and close relationships with broad number of manufacturers from whom they can leverage the technical expertise when needed [54].

### Closing Remarks

It is widely recognized that companies that have made the shift to an integrated MRO approach have been able to capture significant value improvements. For these companies, the move permits the capture of economies of scale in procurement, allows spare parts inventory levels and locations to be optimized, enables supply chain synchronization to ensure parts are available in the right place at the right time, and enables improved visibility into spend, inventory, and asset performance that

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50 MacInnes and Pearce 2003; Witter 2015
51 Croasdale 2014; Gupta and Menon 2012; Terry 2015
52 Exel 2009; GEP 2011; Haubensak et al. 2011; Lewis 2015; Singh 2014; Sudalaikannan 2014; Varghese 2014; Yoo 2012
53 Pak 2015; SDI 2015b; Snowdon 2015; Sutherland and Snowdon 2015a, 2015b
54 Haubensak et al. 2010
provides the basis for ongoing continuous improvement of equipment reliability and maintenance performance. Better operation and maintenance capabilities are also achieved as a result of reduction in machine failures and breakdowns, extension of equipment life, increased equipment reliability and increased plant productivity [55].

Nonetheless, further understanding is required as to how companies embrace in-house and outsourcing models in their integration endeavors, or lack thereof. To gauge the state of MRO evolution and management approaches employed, the Center for Supply Chain Research (CSCR) at the Smeal College of Business at The Pennsylvania State University, in collaboration with the Supply Chain Management Review (SCMR), conducted an online survey during January 29–February 12, 2016. Findings from this survey study will be presented in the part II of this MRO evolution whitepaper series.

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55 Sikich 2013; Ward 2014
References


Ingalls, Preston. 2015. “What the Heck is an MRO.” Modern Contractor Solutions, January.


