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Improving Obsolescence Management by Enhancing Supplier-Customer Collaboration

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Abstract

There are currently many legacy facilities operating in the Middle East & Africa region that have plans in place to extend the plant life. Oil prices have been steadily going up, leading to increases in production, and driving economic growth. In order to extend the life of these older facilities, the sites are budgeting to replace critical parts accordingly. Obsolescence is an inevitable part of every product lifecycle and, with the new wave of technology and AI in the market, facilities face the challenge of increasing profitability in the fast-paced economy. The number of more efficient upgrades available presents an opportunity for strengthening supplier and customer relationships and increasing aftermarket revenues for suppliers. A large amount of data exists regarding the suppliers' installed base at the customer facility, however, navigating that data and adequately communicating the value of obsolescence management both internally within the supplier company and externally to the customer comes with a set of challenges. By investigating the current internal obsolescence management strategies at the supplier, the respective pain points attributed to big data management and internal/external communications will be addressed with the implementation of a framework to streamline the process. A streamlined flow of communication with a customer focused approach from information to orders pertaining to obsolescence will ultimately increase aftermarket revenues for the supplier and increase customer satisfaction.

Keywords

Obsolescence Management, Supplier Relations, Lead Times, Customer Focus and Lifecycle Management.

1. Introduction

Obsolescence is an inevitable part of the lifecycle management of critical process components. The reasons for obsolescence can vary, leaving asset management and reliability teams at industrial facilities having to scramble to identify their obsolete assets and replacements in time for routine maintenance activities. Many questions can arise like: Who to contact? Which parts are available? How long does it take for them to arrive? Will they arrive on time? How much downtime will this cause? How much will this cost? Are there any other obsolete devices that we are not aware of? These are issues that are currently faced by facilities maintenance teams, and it presents an opportunity for suppliers to strengthen their relations with customers and increase customer satisfaction by taking a proactive approach towards obsolescence management from the supplier end.

Supplier lifecycle management teams provide customers with various aftermarket products & services to ensure the longevity of their devices and respective facilities through maintenance, reliability, and throughput solutions. The suppliers also provide Shutdown, Turnaround, and Outage (STO) services which are critical for the customers' facility health. STOs are typically planned months and sometimes years in advance so it is advantageous to plan around the activity as soon as possible to minimize facility downtime. Some of the STO planning components include part lifecycle auditing, criticality ranking, and delivery. Facilities perform major upgrades during STOs, where all down time is equivalent to a loss of production and therefore a loss of profits. In many cases, due to a lack of thorough

diagnostics, a part replacement becomes apparent in the middle of the STO. With the lead times of some parts possibly ranging a year, that is a gamble that no facility wants to face. In addition to managing obsolete assets, this visibility on the installed base presents an opportunity for the supplier to fulfill the new sustainability and decarbonization (S&D), and digital transformation needs of these facilities. The supplier is also committed to their customers' objectives by providing systems that allow facilities to monitor reliability and emissions. A comprehensive obsolescence management strategy for suppliers presents the potential to bundle all of these initiatives in a way that optimizes internal and external operations. Romero et al. (2010) notes that most research on obsolescence has predominantly focused on electronic components, with minimal attention given to a holistic perspective that addresses its effects on mechanical components, materials, software, personnel skills, and processes.

There currently exist many frameworks and articles regarding strategic asset management. Facilities have begun to understand that maintenance is not just a necessary and unavoidable cost, but rather that it is also a contributor to sustaining production capacity (Campbell 2024). Deploying technology with like-for-like replacements employs more value by delivering more functionality which improves operational efficiency. Through planning routine maintenance activities, facilities can ensure the longevity of their assets while minimizing downtime and maximizing throughput. Planning for these activities in advance allows the site to align their parts deliveries, inventory, and supply with their planned downtime. From the supplier's perspective, having this kind of early engagement also allows them to forecast supply for their customers and plan deliveries accordingly. Not all customers are in the same stage in their asset management journey. As a supplier, it is important to engage with customers in order to recognize where they are in their asset management journey. With some suppliers and their customers having been in the market for well over 50 years, it can be difficult for them to track where all of their devices are currently installed. In this article, we will take a facility automation solution supplier that has been operating for over 50 years. We will explore the significance and mutual benefits of obsolescence management between customers and suppliers, some of the obstacles suppliers face, and suggestions for a way forward with customers.

2. Problem Statement

There are currently many legacy facilities operating in the Middle East & Africa region that have plans in place to extend the plant life. Oil prices have been steadily going up, leading to increases in production, and driving economic growth. In order to extend the life of these older facilities, the sites are budgeting to replace critical parts accordingly. The challenge of keeping the pace of production while modernizing accordingly presents an opportunity for the suppliers to increase aftermarket sales while mutually serving their customers to support the region's economic growth. "While "obsolescence management" is mentioned, there are no prescriptive studies that detail the proper identification, analysis, and management of obsolescence or that are conducted in a structured and systematic manner during the phase of the extension of the assets' service life" (Nayara Nunes et al. 2023).

The supplier specializes in automation solutions for industrial facilities. The products range widely and serve many industries around the world. The product life cycles vary and for different reasons. Some of these components are critical to the processes that they enable and can cause significant downtime and safety concerns, leading to a loss of profits and productivity. According to *A framework for the successful implementation of turnaround maintenance projects* (2010), "the average high complexity turnaround exceeds cost and schedule targets by more than 20% and 83% of turnarounds do not satisfy all performance expectations". In order to minimize downtime and operating issues for the sites, there needs to be a proactive approach to managing these obsolete assets. The following cases serve as justification for an obsolescence management framework for suppliers.

2.1 Obsolescence Mismanagement Case

A customer had 27 actuators installed that had gone obsolete and began malfunctioning. There had been no obsolescence notices, no plan, and no communication. The customer demanded that the supplier replace the units free of charge because of this lack of communication. The supplier restored some of the spare parts production as a compromise. There is currently a 3-year plan in place to continue providing spare parts while the obsolete actuators are phased out.

2.2 Obsolescence Management Case

A customer with internal supplier teams having strong relationships with end users in key departments had repeated failures of obsolete actuators. The supplier conducted various site audits to validate the scope and assist the customer with detailed planning, including recommending solutions for bad actors. This resulted in an upgrade of 334 obsolete actuators.

2.3 Future of Asset Management Case

The instrumentation team received a tender from a customer for transmitters with the condition of providing a tagging facility for automatic identification and data capture. This is not currently a feature that the supplier provides. Customers are interested in maximizing their asset visibility and incorporating tracking features.

3. Literature Review

Maintenance has evolved from a simple task to a critical process for modern businesses, with proactive approaches increasingly emphasized. The need for effective maintenance has led to the development of specific KPIs and obsolescence models to assess equipment health and manage aging components, especially in industries like defense where obsolescence is common. Companies prioritize maintenance actions, potentially avoiding costly replacements through early intervention. For components at high risk of obsolescence, a proactive retrofit plan can extend the equipment's useful life, optimizing costs and maintaining operational efficiency (S. Ferreira et al. 2019). A proactive method for component obsolescence management leverages long-term forecasted component lifecycle data and related parameters to manage system lifecycle more effectively. Unlike reactive management, where only obsolete components are addressed individually, this model optimizes the entire lifecycle, minimizing obsolescence costs and improving decision-making. The proactive model significantly lowers obsolescence management costs (51.7% cost avoidance) and provides additional benefits like improved inventory management, accurate budget forecasting (X. Meng et al. 2014). A study on obsolescence management on electrical components in oil and gas facilities by A. M. Al-Qahtani et al. (2010) where the methodology consisted of site surveys, vendor surveys, database development of equipment, scoring and ranking of equipment, and roll-in replacement revealed that most vendors confirmed they would continue supporting equipment for three to five more years, but 22% of the equipment was classified as medium-risk due to the potential end of vendor support within that time frame. The roll-in replacement of circuit breakers and motor starters using vacuum technology was identified as a valid, economical solution for extending the life of switchgear by up to 15 years, rather than complete replacement of electrical systems. The program emphasized the importance of proactive condition assessments to determine the actual state of the equipment, ensuring replacements were necessary only when the equipment was beyond repair. Efficient management of surplus materials was highlighted as a cost-saving measure, allowing aging parts to be reused and extending the service life of other equipment. These findings and methods allowed the company to manage obsolescence more effectively while minimizing capital expenditures.

Most existing literature in inventory management focuses on demand uncertainty, with relatively limited attention given to lead-time uncertainty, despite its disruptive impact on supply chains (O. Ben-Ammar et al. 2022). Lead-time uncertainty refers to the variability or unpredictability in the time it takes for goods, materials, or components to arrive after an order is placed. In supply chain and inventory management, lead time is typically considered a fixed period, but in reality, it can fluctuate due to factors like production delays, shipping issues, supplier constraints, or demand surges. When lead time is uncertain, it becomes challenging to manage inventory levels effectively because it impacts how much stock is needed to avoid shortages. Companies may face higher costs, delayed production, or service disruptions if lead times are longer than anticipated, while shorter-than-expected lead times can result in excess inventory. Managing lead-time uncertainty is crucial for ensuring smooth operations, optimizing inventory costs, and maintaining high levels of customer service. Reactive maintenance comes at a high cost, causing an increase in unpredictable expenses. Storing spare parts for long-term use as a preventive measure requires significant investment in inventory and storage, which can increase the total cost by 20% or more annually. Reducing lead-time decreases inventory costs by lowering safety stock requirements and allowing for more accurate demand forecasting. However, it often increases procurement costs due to higher supplier charges for shorter lead-times. An alternative would be to plan accordingly with suppliers to align with maintenance schedules. Early engagement is key to ensuring on time delivery for parts and equipment. (Charu et al. 2008).

Older, obsolete components are often less energy-efficient than newer technology, increasing the carbon footprint and operational costs due to higher energy demands. Data centers face significant challenges from vendor-driven obsolescence and supply chain dependencies, as reliance on external suppliers and service providers can lead to costly upgrades, delays, and potential downtime. Rapid technological advancements and compatibility issues further pressure data centers to frequently upgrade equipment to maintain competitiveness, often resulting in extensive and costly system changes (Figure 1). Obsolescence in data centers can lead to downtime, performance issues, and increased customer expectations for sustainability, impacting service reliability, financial performance, and reputation. (Schulze et al. 2021).

4. Methodology

The automation solution supplier is divided into 3 main business sections: Instrumentation, Final Control (various valves and actuators), and Systems & Softwares. To maximize the value chain for customers, the first step of the methodology is to audit the internal processes, ensuring customer focus when creating the framework for obsolescence management.

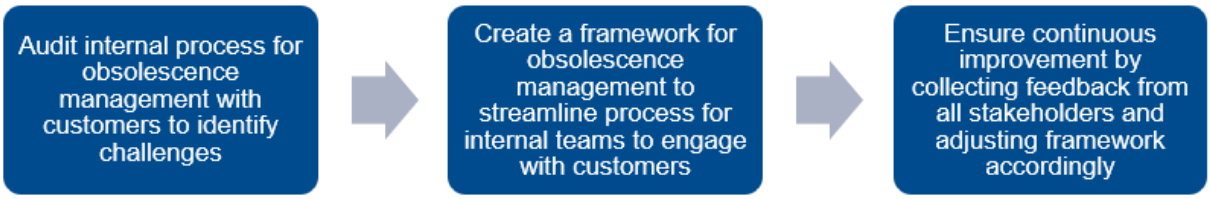

Figure 1. Methodology for creating an obsolescence management framework for suppliers

5. Problem Identification

We begin with interviewing employees at the supplier company to identify the challenges associated with obsolescence management.

How does your business section currently manage obsolescence?
What are the pain points associated with obsolescence management in your business section? (Table 1)

Table 1. Results of interviews with team members in different business sections

Products	**Results**
Actuators	- Very old installed base - Many acquisitions by mother company - Lack of awareness of umbrella brands by customers - Limited resources for field service site visits
Instrumentation	- Gaps in installed base due to acquisitions - If obsolete device has been replaced by customer, there is no way to update information in internal system - Obsolescence can be linked to changes in naming convention
Pressure Regulators	- Install base is difficult to compile due to the nature of the location of these valves (they can be in hard to reach or hazardous places) - Limited resources for field service site visits - Some valves are very old with illegible serial numbers which hinders tracking and some customers won't have visibility of the valve's health
Isolation Valves	- A lot of discontinuity between products across portfolio - Many acquisitions by mother company - One line of valves was discontinued abruptly due to the factory being shut down - Installed base tracking through internal or customer data is very time consuming and doesn't always lead to increases in revenue from sales (due to the nature of the business requiring customization for application)

Flow Valves	- The nature of this business heavily relies on aftermarket revenue so there is relatively good visibility on installed base and obsolescence management
Softwares & Systems	- Windows based softwares require upgrading according to updates - Systems contain electrical components that require replacement with technological advances

The supplier organization is currently set up to have a representative team that caters to the customer on a regular basis. Each representative team has a team leader, and 10 of them were interviewed to understand the challenges they face when communicating obsolescence with customers.

How do you currently track and manage obsolescence at your site?
What are the main challenges you face in managing obsolescence
Are there issues with communication between departments?
How do you communicate obsolescence with customers? And how does it impact your relationship?
What tools do you use? Are there any gaps?
How prevalent is obsolescence at your site?
What training or guidance would be helpful for you to manage obsolescence more effectively? Are there any resources you feel would be helpful?
How do you collaborate with other departments on obsolescence issues?
What is your strategy for transitioning a customer to a newer product or alternative?
How early do you prefer to know about upcoming obsolete products? How do you plan for it?

The questionnaire revealed the major obstacles that were faced fell under the categories of big data management and communication. While most information can be found in data archives, there are many challenges around finding the relevant information needed to manage obsolescence. There exists installed base data internally, however, the only way to verify that the information is accurate is by cross checking the customer's installed base or having a field engineer manually check on site. It can take well over 3-6 months to mine through the data archive to consolidate the relevant data to be presented to the customer. When considering the investment of time and resources on such a data mining project, one must also consider the ROI. For some business sections this may be a profitable direction to take, others will require eyes on site to be able to ultimately generate revenue. This is due to the custom specifications of the device required for the application. The supplier is currently integrating a Digital Installed Base Software where customers can track their asset health, view lifecycle status, reference relevant documentation, request services, and order parts/replacements. This acts as an interface between the customer and the supplier to track installed base, however, given the large amount of data that has yet to be verified/validated, adoption of the software both internally and externally has been challenging. Given the nature of the industry, products can be difficult to trace after their purchase due to OEMs sourcing parts from suppliers and integrating them to provide a final solution for customers. With a supplier company dating over 50 years old, and customers having products with life cycles ranging 10-30+ years, sometimes the only way to verify the product's supplier is by having a service engineer conduct a site visit.

6. Results

Upon identifying the problem through the internal audit, we are able to develop a process flow that maximizes the value chain of obsolescence management between suppliers and customers (Figure 2).

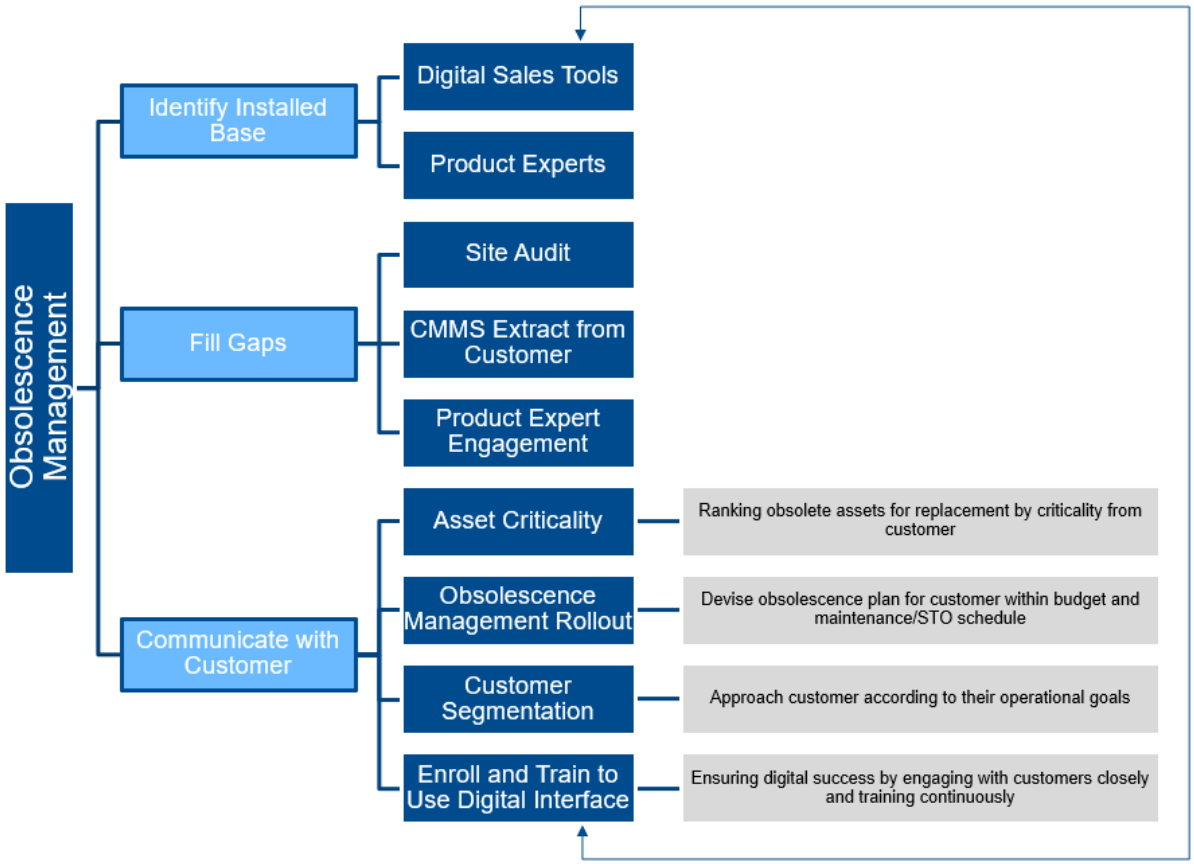

Figure 2. Obsolescence Management Process Flow

This transition towards digitization requires a great deal of collaboration both within the supplier teams and with the customers. Technological advancements are moving at an incredibly fast pace, as such the transfer of knowledge from one individual to another is crucial. Trevelyan (2014) states that a large part of our knowledge is formed through social interactions, which is particularly essential in engineering organizations, where the success of the enterprise heavily depends on the quality of knowledge created and applied by its members. The enterprise can only work well when everyone can access the knowledge they need by working collaboratively with other people. Ideally, the enterprise should have one unified system that is accessible to all and connects to everything that is happening.

7. Hypothesis

Customers are already on their journey of operational excellence. Given the results of this project, implementing an obsolescence management framework from the supplier to assist their customers could significantly enhance operational excellence. By adopting a proactive approach to asset lifecycle management, organizations can shift from viewing maintenance as an expense to recognizing it as a strategic advantage. Proactive maintenance costs significantly less than unscheduled or breakdown repairs, highlighting the value of a structured approach to minimizing costs and maximizing uptime. Additionally, strategic maintenance maximizes profitability and longevity of a facility. Suppliers can recognize where their customers are in their operational excellence journey to know how to approach them regarding obsolescence management, and help customers achieve their operational excellence goals (Figure 3 and Table 2).

Figure 3. Spectrum of customer operational excellence journey

Table 2. Strategic approach for each customer segment

Customer Profile	Approach	Goal	Actions
Reactive	Foundational Support and Education	Shift customers from reactive to preventive mindset	- Introduce the Basics of Obsolescence Management - Education and Awareness Sessions - Quick Wins for Trust-Building
Proactive	Develop, Expand, and Formalize Preventive and Predictive Maintenance	Build a robust, predictive maintenance strategy that aligns with both short-term operational needs and long-term obsolescence management goals	- Implement Obsolescence Management Framework and Roadmaps - Coordinate Long-Term and Preventive Planning - Highlight Benefits with Performance Data - Conduct Quarterly Reviews and Adjustments
Strategic	Integrate Obsolescence Strategy with Corporate Goals	Enhance alignment of maintenance strategy with corporate objectives for better ROI and operational resilience	- Align Maintenance and Corporate Strategies - Advanced Predictive and Preventive Maintenance - Develop Customized Performance Metrics - Showcase Long-Term Savings and Risk Mitigation - Internal Training for Alignment

Through the asset lifecycle management approach, maintenance becomes a driver for sustaining productivity, improving accuracy, and reducing costs. It aligns asset management practices with broader supply chain goals, optimizing both the flow of materials and the information exchange from customers back to suppliers. This approach minimizes inventory and work-in-progress (WIP), supporting a streamlined supply chain that maximizes output with minimal waste. In a competitive market, this control over maintenance decisions is essential for business continuity (Figure 4, Figure 5, Figure 6).

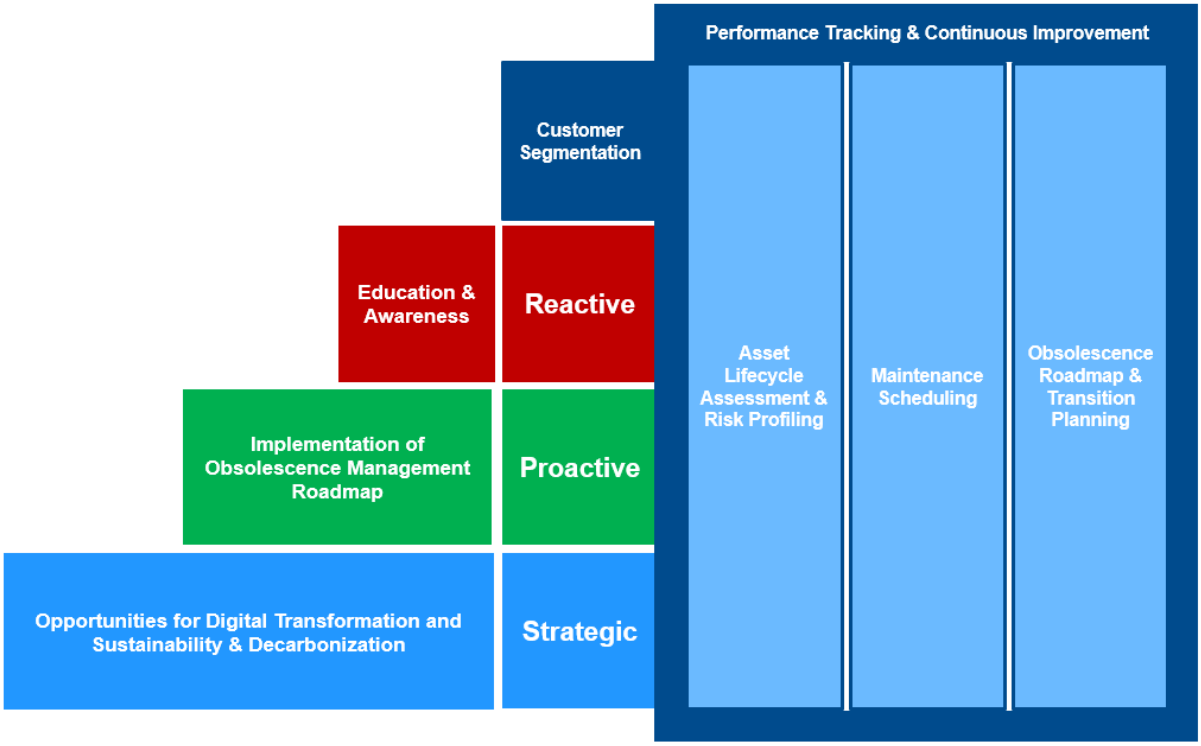

Figure 4. Customer segmentation showing a continuous loop of improvement throughout the obsolescence management process

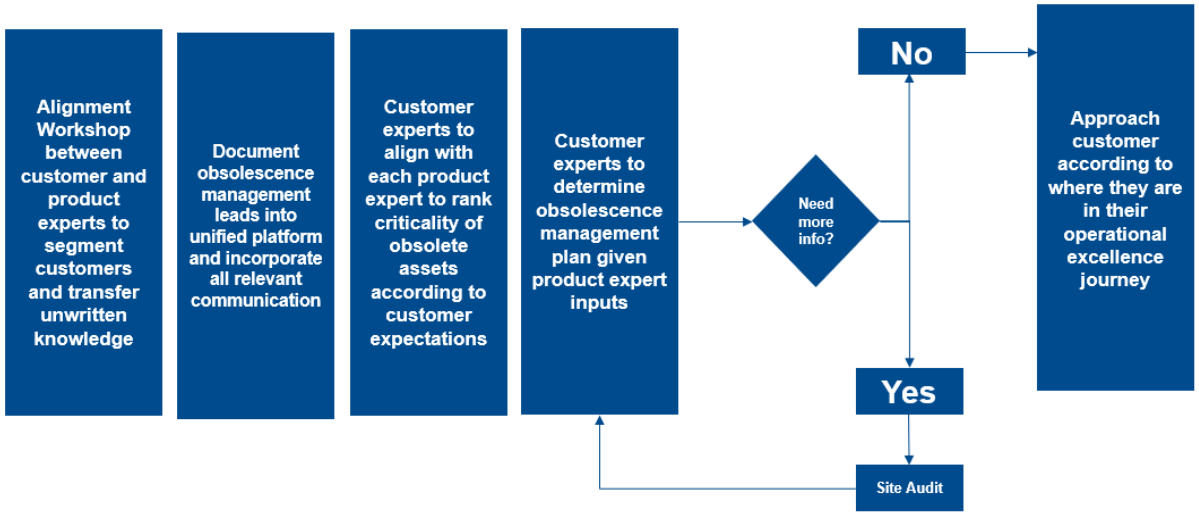

Figure 5. Obsolescence Management Framework for Suppliers

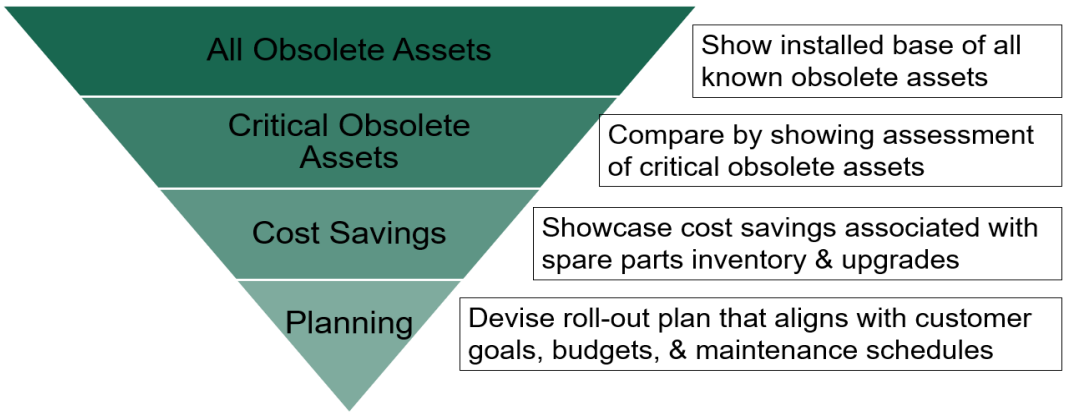

Figure 6. Obsolescence Management Plan

Ultimately, effective obsolescence management necessitates collaboration among stakeholders, as it drives continuous improvement across the supply chain and ensures assets operate efficiently, safely, and in compliance with international regulations.

8. Conclusions

Maintenance has been steadily evolving with current technology allowing facilities to manage their assets through condition monitoring through diagnostics enabled by machine learning and data driven analytics. By upgrading devices that can provide data and run analytics, facilities can foresee problems and fix them accordingly. This advancement in asset management capabilities requires an effective method for phasing out obsolete assets, such as to maintain productivity, increase profitability, and increase operational efficiency (Figure 7).

Figure 7. Evolution of Maintenance

Given the new wave of digital transformation and AI penetrating the industrial automation market, suppliers should ensure their readiness to commit to their customers' needs. Optimizing parts replacements and upgrade replacements deliveries requires planning far in advance between the customer and the supplier. In this fast-paced economy, there is very little room for operational delays as every additional minute of downtime at a facility can be incredibly costly. A streamlined communication process between suppliers and customers can ensure a smooth transition for facility life extensions and revamps. Maximizing visibility of supplier installed base at customer facility allows the supplier and the customer to work together to devise obsolescence management roll outs within budget constraints, around routine maintenance activities, and with just-in-time deliveries.

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Biographies

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Dr. Imran is currently serving as an Assistant Professor of Industrial Engineering in the Mechanical and Industrial Engineering department at RIT Dubai. He earned his PhD in manufacturing engineering from Loughborough University in the UK. Dr. Imran's doctoral research focused mainly on semantic data modeling and interoperability in manufacturing systems. Dr. Imran also completed his master's degree in advanced manufacturing engineering and management from the same university, with his major project focusing on knowledge-based tools. Before joining RIT Dubai, he had more than 10 years of experience working in the higher education sector. Dr. Imran has experience working on various committees in different roles and has taught a range of courses at both the undergraduate and graduate levels. He has also been involved in curriculum development and program evaluation to meet the requirements of various accreditation bodies. Currently, Dr. Imran is engaged in teaching undergraduate and graduate courses at RIT Dubai.