



INDUSTRIAL INTERNET OF THINGS (IIOT) IN MRO





Understanding IIoT: IIoT is the next stage of the industrial revolution. It is a virtual platform comprising of a network of interconnected devices to collect and share data. This data is then sent to a central dedicated server (in some cases, cloud servers) to be aggregated and analyzed using the power of big data analytics and Artificial Intelligence (AI). Industries are able to leverage IIoT platforms to make rapid business critical decisions and automate many of the production processes.

IIoT in MRO: Maintenance, Repair and Operations (MRO) is a critical category for continuous operations in manufacturing companies, however, to effectively manage the category is a challenge. There are two major characteristics of MRO which make the management of this category challenging:

- High volumes of multiple SKUs (Stock Keeping Units) which make inventory management particularly challenging.
- MRO materials and service requirements are fragmented across operations floors and different types of machinery; making categorization, demand-tracking and forecasting to be a cumbersome process.

The scope for savings in this category have made it a strategic focus for companies across all major industries. Currently, companies invest in the development and deployment of software tools that can be integrated with ERP systems to better manage MRO requirements. These tools rely on traditional practices like min-max calculations to better manage MRO inventory. While these approaches optimize inventory they are not capable of predicting demand requirement or

any potential component failure. Another trend in the market is the adoption of e-procurement tools for better price negotiations and pricing transparency. However, these virtual platforms are managed manually, slowing the entire process.

To increase efficiencies, further IIoT systems are being researched, developed and deployed (for few use cases). These systems gather real time data from smart sensors and components to predict and anticipate the potential failure of equipment across the manufacturing floor. The system then develops the sourcing and procurement plan for various components. Aggregated data on pricing through various portals, catalogues and e-procurement platforms, enables the system to anticipate the right price for various components, hence automating a major time-consuming task for procurement groups.

IIoT is a connected ecosystem of machineries enabled by the combination of advancements in key areas of technology as mentioned in Fig.1.

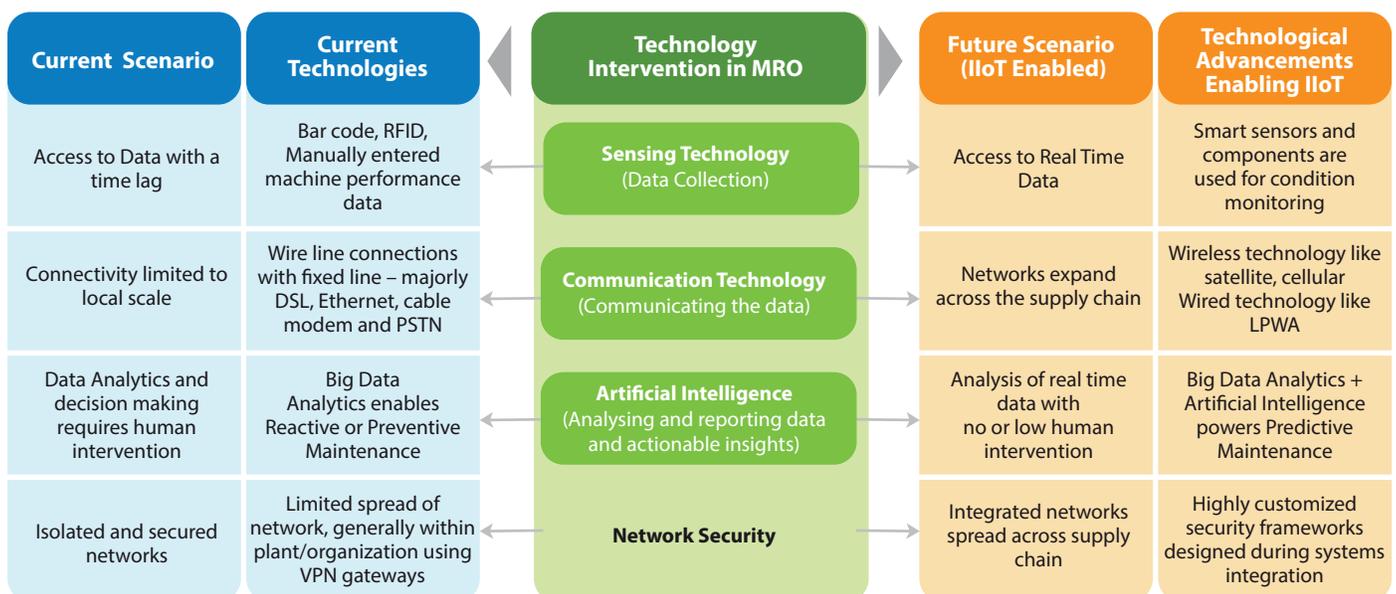


Figure 1: Transformation to IIoT

One of the key outcomes of IIoT in MRO is predictive maintenance. It has the potential to almost eliminate manual intervention and achieve greater operational efficiency. A typical use case for predictive maintenance is depicted in fig 2.

Predictive Maintenance: IIoT enabled machineries predict a potential breakdown or component failure well in advance and carry out the following operations to prevent the issue from impacting the operation.

- **Accurate Demand Prediction** – Predicts the inventory requirements and potential price of the components based on the inputs from various sensors and online market places/catalogues.
- **Automated Procurement** – Evaluates the possible routes to market such as: e-auction, RFP/Q or catalogues.
- **Automated Production** – Uses 3D printers to print the various components, if feasible.
- **Automated/Manual Repair and Maintenance** – Low cost labor will be used for repair maintenance activities, until robots with similar capabilities are developed at a competitive cost.

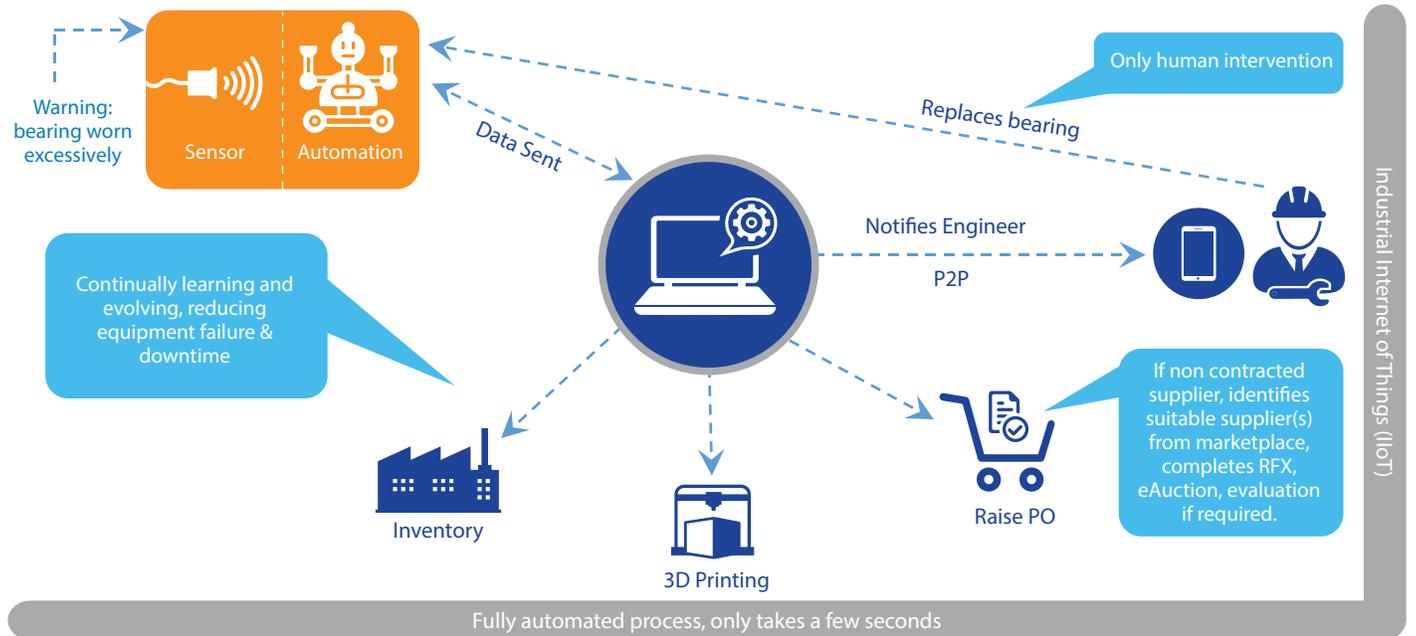


Figure 2: Predictive maintenance using IIoT

Potential Impact of IIoT on MRO Operations

- **Increased demand for catalogs/e-procurement** – IIoT solutions for MRO are expected to drive adoption of e-procurement platforms and catalogs. Information from such platforms are inputs for the IIoT system which is expected to use AI (Artificial Intelligence) to take decisions on the best price, quantity and time.
- **Increased efficiency in MRO inventory management** – IIoT systems would utilize AI to deliver 10 – 30%¹ higher efficiency in inventory management compared to current MRO software tools which rely on min-max calculations to develop the inventory requirements.
- **Optimization of Tail Spend** – IIoT’s ability to predict the demand accurately, in advance, reduces the number of spot purchases. Also the highly streamlined purchasing process allows the system to check the inventory-in-hand first, reducing redundancy in purchase. If not available in the inventory, the system is directed to source from the contracted suppliers ensuring 100% compliance. This optimizes the tail end spend.

Key Benefits of IIoT in MRO	Improved Operational Efficiency	Improved Asset Utilization	Efficient Categorization
	Reduction in tail spend	Reduction in equipment lifecycle costs	Reduction in risk of counterfeit parts

¹ <http://blog.oniqua.com/application-of-machine-learning-in-mro-inventory-and-maintenance-management>

Potential Impact of IIoT on MRO Supply Chain

- **Entry of new supply chain participants** – IIoT platform providers, data management companies, analytics companies, network and cloud services companies would become a significant part of the MRO supply chain. Their interactions and collaborations with the OEMs (Original Equipment Manufacturers) will also impact the bargaining power of the buyers/suppliers
- **Emergence of MRO-as-a-service** – MRO as-a-service is likely to emerge as a preferred new business model as it takes over the entire MRO procurement activity, including system integrators to develop the IIoT system, maintenance of various software, supplier identification and negotiations and network security. MRO-as-a-service model is likely to evolve, acting as a one stop solution for all MRO needs



Conclusions: A key challenge to proliferation of IIoT is the requirement for highly customized solutions for various industries and manufacturing processes. This customized nature of IIoT solutions increases the initial investment in technology. However, growing demand and new companies that specialize in IIoT solutions are expected to optimize the cost of implementation over the next 5 years. Companies that have already invested in IIoT have found that the benefits outweigh the costs by huge margins. World industrial automation survey conducted in 2016-17² projects that companies that have invested in IIoT have at an average witnessed improved operational efficiencies by 47% and downtime reduction by 28%.

Many companies have now allocated budgets for IIoT and the market is estimated to reach US \$124³ billion by 2021. Industries like mining sectors, which have invested in the technology have witnessed up to 400%⁴ increase in their production.

The emerging global technology trends are increasingly improving the connected nature of businesses and societies, making the transition to IIoT inevitable in the near future.

² <https://www.i-scoop.eu/internet-of-things-guide/industrial-internet-things-iiot-saving-costs-innovation/>

³ <https://www.i-scoop.eu/internet-of-things-guide/industrial-internet-things-iiot-saving-costs-innovation/>

⁴ <https://www.i-scoop.eu/internet-of-things-guide/industrial-internet-things-iiot-saving-costs-innovation/industrial-internet-mining-case/>

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