Gartner

Competitive Landscape: IoT-Enabled Predictive Maintenance Solution Vendors

Published 8 June 2021 - ID G00743049 - 16 min read

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Initiatives: Technology Market Essentials

IoT-enabled predictive maintenance has become a preferred pilot initiative for technology-led digital business transformations among different industries. Technology and service providers of predictive maintenance must develop longer-term strategies and partnerships for sustainable revenue.

Overview

Key Findings

- Legacy predictive maintenance solutions, as part of asset performance management (APM) solutions, are being disrupted by Internet of Things (IoT)-enabled alternatives that allow for more comprehensive and real-time data acquisition.
- Stand-alone predictive maintenance software and hardware solutions enabled through IoT have become more common pilot initiatives for commercial and industrial sectors.
- Achieving substantial improvements through predictive maintenance requires the combined implementation of IoT-enabled predictive maintenance solutions and supporting services.
- Differentiation through innovative pricing models and third-party underwriting has started to emerge to create an outcome-driven market space to gain customers' trust.

Recommendations

Technology and service providers examining the competitive market landscape for IoT-enabled predictive maintenance solutions as part of technology market essentials should:

- Offer IoT-enabled predictive maintenance as the pilot (application) initiative for digital business transformation by developing a quick-to-implement and quick-time-to-value solution.
- Build on the drive for the composability of software assets by producing stand-alone predictive maintenance solutions based on combinations of software and hardware capabilities [1] and open to integration with other combinations of hardware and software architectures.

- Avoid one-size-fits-all predictive maintenance solutions by developing industry-, equipment- and process-specific solutions that require detailed understanding of general thresholds, as well as asset-specific profiles and supportive services such as training.
- Develop sustainable revenue streams from predictive maintenance solutions by merging “land” pricing models around “outcome-based” solutions initially, and “expand” strategies through enterprise pricing models in line with subscription models.

Strategic Planning Assumption

By 2026, 60% of IoT enabled predictive maintenance solutions will be delivered as part of enterprise asset management products, up from 15% today.

Analysis

Gartner defines the predictive maintenance (PdM) market as the hardware, software and service components to provide predictive analytics for mechanical assets and infrastructure maintenance and reliability objectives. PdM covers a wide variety of enterprises as well as opportunities within a single organization that includes but is not limited to discrete and process manufacturing, mining, transportation, energy and utilities, buildings, infrastructure, healthcare, automotive, and construction. PdM applies to non-IT assets and infrastructure typically monitored and managed by operational technology (OT). Examples of OT include industrial control systems (ICS), distributed control systems (DCSs) and programmable logic controllers (PLCs). PdM shares a range of predictive insights by combining the capabilities and values of multiple artificial intelligence (AI)-enabled techniques and applications. Reasons for investing in PdM include benefits such as decreased downtime, reducing mean time between failures (MTBF) and mean time to repair (MTTR), and increased reliability.

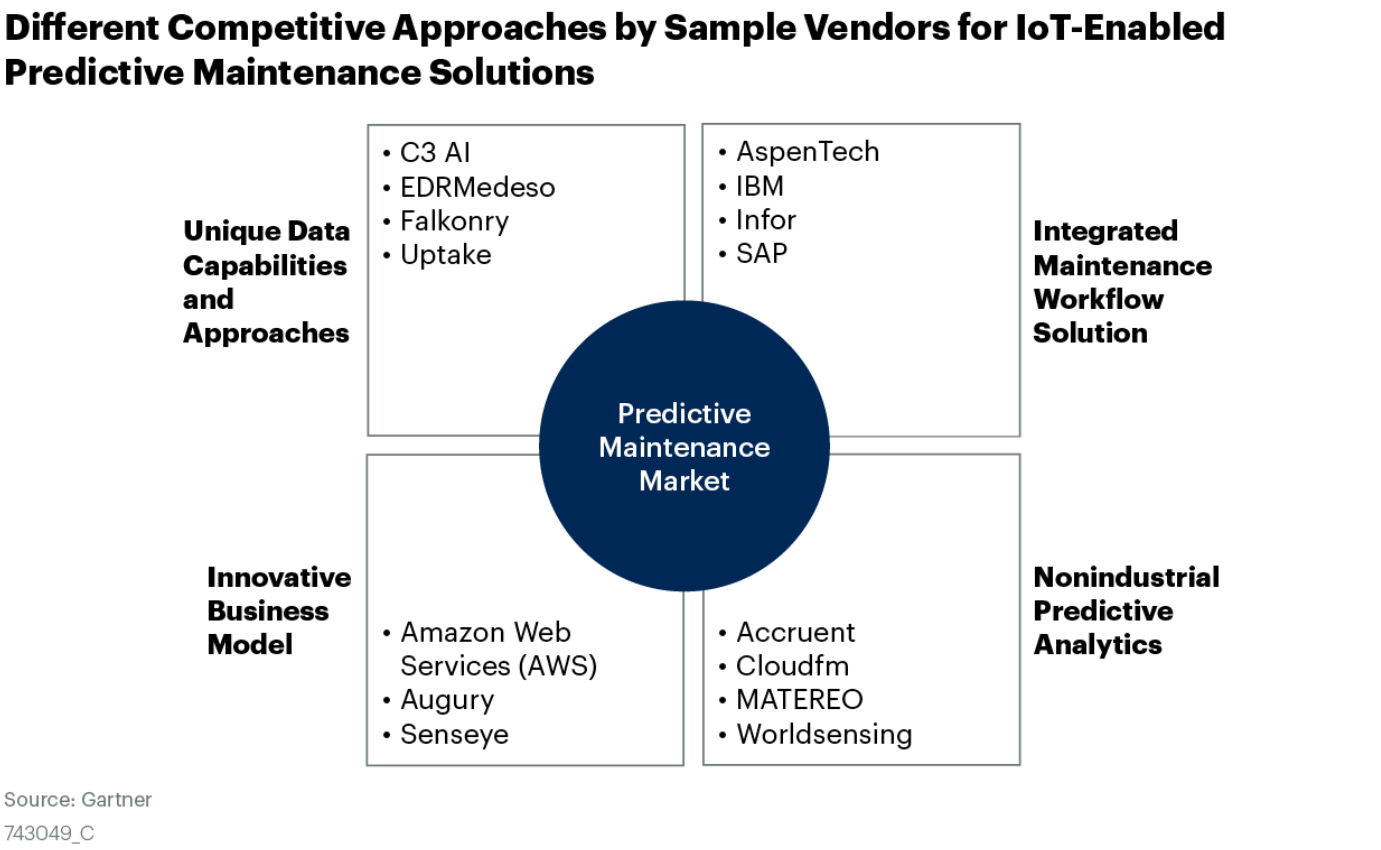
In asset-intensive industrial segments, predictive maintenance remains closely associated with asset performance management solutions, and forms an integral part of these functionally comprehensive solutions that also include reliability-centered maintenance (RCM), asset risk and strategy management, and predictive maintenance forecasting (see Market Guide for Asset Performance Management Software).

The impact of improved data acquisition through extended instrumentation with sensors, IoT platforms and enhanced analysis and AI-techniques has moved PdM to substantially improved levels of insight and accuracy (confidence level and time window of forecast). Advances in, for example, acoustic and video technologies, have improved the extent of data sources for insights in continuous processing industries where failure rates may be limited, and analytics techniques too restricted to perform anything other than threshold alerts (condition-based maintenance or CbM). In less industrial environments, such as healthcare, buildings and public infrastructures, PdM benefits have been recognized and provide additional opportunities for providers to extend from singular assets and equipment to complete processes and environments.

Competitive Situation and Trends

Adoption of IoT-enabled predictive maintenance solutions has extended beyond being a feature within APM solutions. Innovations in sensor and IoT platform technologies and enhancements to analytics and AI techniques have driven investments by industrial and commercial buyers in IoT-enabled PdM software solutions without complete APM configurations. The number of PdM solution providers continues to grow with hardware, platform and analytics vendors, including industrial and commercial original equipment manufacturers (OEMs) and existing condition monitoring and APM solution providers all competing in this market space. As competition intensifies, technology and service providers must design differentiated products and go-to-market strategies for their positioning and messaging of their PdM solutions with maturing maintenance clients. Gartner has identified four different approaches, which are illustrated in Figure 1.

Figure 1: Different Competitive Approaches by Sample Vendors for IoT-Enabled Predictive Maintenance Solutions



Predictive maintenance solution providers may compete with more than one of the four identified competitive approaches. For illustration purposes, Gartner has aligned a selection of providers of each trend without any intentions of identifying these providers as recommended or leading in this space.

Integrated Maintenance Workflow Solutions

Effective PdM solutions provide end-to-end capabilities from data acquisition through to data management at the platform level, deeper analytical and AI-driven insights, and prescribed corrective

actions. To achieve tangible business outcomes, such as maintenance budget savings and improved machine uptime, vendors of PdM solutions position the importance of clients being prepared for two courses of action — either to:

- Implement the behavioral changes in how the asset is operated based on the new predictive insights or
- Work with the PdM vendor to ensure the necessary corrective actions (and nonactions) are taken

Together with having the required and associated solutions to perform the workflow requirements of maintenance management such as job and work order scheduling, parts ordering and asset inventory management, the value of predictive maintenance is only truly achieved when an integrated maintenance workflow solution is provided. Providers of APM (such as IBM, Infor and SAP) that are linked to enterprise asset management solutions have enhanced their predictive analytics capabilities as part of an overall workflow solution for maintenance.

Unique Data Capabilities and Approaches

Innovations in data processing have accelerated the extension and analysis of data sources. Innovative PdM vendors — previously limited to operational data from connected PLCs and DCSs — have extended the scope of datasets. This action enables predictive analytics to include combinations of historical data and real-time data from PLCs and DCSs, as well as new sensors both in and around machinery. In other use cases, vendors have uniquely leveraged engineering designs and customer model data to augment the build and capabilities of their predictive algorithms. Others have invested greater efforts in data management at the schema process level. Finally, the unique data capabilities extend beyond the acquisition and augmentation steps and include self-learning and/or supervised learning steps that continuously maintain and improve the models used to analyze the data.

Focusing on the importance of data and predictive analytics as an integral part of predictive maintenance solutions has enabled a number of vendors to position and message the strength and capabilities of their solution around their unique data capabilities. The unique data approach in its various forms has been leveraged by such vendors as Uptake, Falkonry, C3AI and EDRMedeso.

Innovative Business Model

Enhancements to APM solutions and predictive analytics capabilities focus on improvements to features and functions of existing capabilities to address the operational results from such investments. Such investments are, however, difficult for vendors to achieve from clients who:

- Remain cautious about the risk versus the benefits in financial terms
- Do not have large budgets to cover such expenses, and are challenged in making the business case to their chief financial officers

Combined with the growing confidence in their own PdM technologies and abilities to predict failures, vendors have innovated with different business models — one being guaranteed outcome-based business models. These business models have emerged in various guises and share one common characteristic: If the client does not achieve the agreed results from the vendor's solution, financial compensations will be made. Vendors having launched such business models include Augury, Relayr and Senseye. Another business model, driving quicker trials and implementations through productized hardware and software at competitive pricing points, has also been launched by such vendors as Amazon with Amazon Monitron.

Nonindustrial Predictive Analytics

The value of PdM has remained closely associated with asset-intensive industries. Returns on investment from PdM solutions here have started to show reductions to planned maintenance budgets between 15% and 30% and reduced downtime rates for improved machine utilization between 2% and 8%. The power of predictive analytics for maintenance use cases extends PdM's application by domain-focused vendors to other sectors such as critical infrastructures, buildings and healthcare. These opportunity areas analyze different OT datasets and deliver different analytical insights. Similar to industrial sectors, the client business outcomes for nonindustrial sectors are focused not only on health and safety, and regulatory compliance, but also sustainability and tangible financial savings. Vendors implementing PdM solutions in these nonindustrial markets include Accruent, Cloudfm, MATEREO and Worldsensing.

Competitive Profiles

The scope of providers positioning a PdM solution varies from those offering a software-based threshold monitoring application with minimal predictive insight around possible failure to providers with integrated hardware and software anomaly detection solutions for single asset failures or to determine remaining asset life, to artificial intelligence solutions with advanced learning techniques to determine prescriptive courses of maintenance action with continuous and unique asset learning. Other providers may have built complete professional service portfolios in conjunction with their PdM solutions. Gartner has identified more than 160 providers claiming basic to complex PdMmaintenance solutions for industrial and nonindustrial use cases. Narrowing the scope to the four competitive trends outlined, the following providers represent examples of each of the trends.

AspenTech

Product or Portfolio Overview

Aspen Technology, a public company founded in 1981 and headquartered in Bedford, Massachusetts, provides asset optimization software and services. AspenTech's PdM solution is part of the combination of acquired capabilities from Mtell and Fidelis (for reliability engineers), ProMV (for process engineers), Aspen Event Analytics (for operators and plant engineers) and Aspen Cloud Connect.

How AspenTech Competes

AspenTech has an established predictive asset management and condition-based maintenance provider role, and through acquisitions of companies such as Mtell, Fidelis, Mnubo and, most recently, OptiPlant, continues to extend the scope of its asset optimization software capabilities, including PdM. AspenTech competes with a cloud-ready infrastructure, focused on enterprisewide visualization and AI insights, and competes on the integrated workflow maintenance from predictive insights to process optimization, including planning and scheduling. Providing granular equipment and asset insights through the Mtell Agent approach remains an additional cost factor to implementation of the solution but yields substantial root cause insights.

Augury

Product or Portfolio Overview

Augury, a private company founded in 2011 and headquartered in New York, New York. It provides a Machine Health as a Service solution that is an autonomous and proprietary full-stack sensing solution with integrated hardware and predictive and prescriptive insights through AI. The company serves process, consumer packaged goods (CPG), food and beverage, chemicals and petrochemicals, pulp and paper, and building material sectors, as well as equipment manufacturers of rotating equipment. Major clients include Colgate, P&G, Frito Lay, Nestle, Heineken, Essity and Hersheys.

How Augury Competes

Augury provides a holistic machine health and performance approach that includes Guide and Act on top of Monitor and Diagnose. It has overtaken several competitors through the combination of the following:

- Available hardware as part of the service
- Predictive as well as prescriptive insights with explanations
- A collaborative application to capture the maintenance of “conversational” records
- Dedicated customer success service to ensure global deployment and rapid adoption
- Guaranteed insights through AI

The offering includes a reimbursement of Augury’s clients up to the value of US$100,000 if a piece of equipment fails because the AI diagnostics didn’t detect an issue. This guarantee is underwritten by insurers Munich RE (HSB).

Cloudfm

Product or Portfolio Overview

Cloudfm, a private company founded in 2011 and headquartered in Colchester, U.K., is a recognized innovator, winning the Queen’s Award for Innovation, in the provision of compliance, maintenance and

facility management technology and consultancy services. Specializing in clients with complex multisite operations, Cloudfm's Mindsett platform captures and processes data from assets and equipment, enabling insights for automation and prediction through machine learning and artificial intelligence. The Mindsett platform integrates with Cloudfm's well-established Freedom platform that automates subsequent maintenance, workflow, quality control, validation and financial administration. Cloudfm has noted growing interest for its PdM solutions in distributed businesses such as KFC, Pizza Express, Wolseley and national institutions such as the NHS, and healthcare, school trusts and universities.

How Cloudfm Competes

Introducing the principles and technologies of IoT-enabled PdM to facility management and its distributed client base, along with partnering with national institutions such as the NHS, universities and education, Cloudfm has continued to disrupt and innovate in this marketspace. Previously offering a manual inspection and maintenance work order response service, Cloudfm is shifting the traditional facilities management approach of scheduled preventive maintenance and emergency reactive calls to an intelligence-led operating model connecting clients' asset demand with skilled engineering supply through Mindsett's predictive platform. With Mindsett, Cloudfm extends assets' workable life and reduces unplanned downtime and equipment breakdowns, achieving a typical 65% reduction in reactive job spend for clients and associated trading losses.

EDRMedeso

Product or Portfolio Overview

EDRMedeso, a private company founded in 1987 and headquartered in Västerås, Sweden, unlocks PdM for industrial assets and equipment with data from engineering simulations and proprietary engineering analytics intellectual property designed by EDRMedeso. Clients include Rolls-Royce Marine and Valmet.

How EDRMedeso Competes

EDRMedeso is a niche engineering-focused provider of PdM solutions. EDRMedeso achieves comparative levels of predictive analytics insights by combining data from engineering simulations and analyzing that data with models developed on the basis of engineering algorithms and statistical wrappers. This allows for the EDRMedeso PdM solution to deliver both predictive maintenance insights and remaining design life of products. The unique data approach is one that resonates well with clients in highly regulated industries where design life predictions are critical and where the installation of additional sensors and devices may be restricted if not prohibited.

Falkonry

Product or Portfolio Overview

Falkonry, a private company founded in 2012 and headquartered in Sunnyvale, California. It focuses on predictive digital twins with Falkonry Clue, ingesting data from existing data sources such as historians, PLCs, supervisory control and data acquisition (SCADA) systems and other enterprise data sources. The process-oriented PdM solution creates an inventory of data tags and data rates, and brings predictive

insights to the combination of reliability, process and maintenance engineers. Clients include Ternium, IMA Life, Grupo Bimbo and the United States Air Force.

How Falkonry Competes

Falkonry competes with other providers of PdM solution by pointing out the value of having an intelligence-first approach (i.e., identifying the nature and value of existing data beyond external signature data, and how quickly first insight can be delivered). Falkonry positions its Site Survey as the important first step to determine what data is available and what value it can deliver, contrary to data-first approaches. In data-first approaches, “mechanical” data acquisition and processing is initially separated from the analysis — value creation — insight process.

MATEREO

Product or Portfolio Overview

MATEREO, a private company founded in 2014 and headquartered in Coimbra, Portugal, leverages predictive analytics techniques to provide important maintenance insights around critical infrastructures — such as bridges, overpasses and railway lines — detecting displacements and movements for structural maintenance operations. Clients include Central Atlantic Railroad VLI683, Brazil, and Brisa, Portugal.

How MATEREO Competes

Leveraging insights from earlier technology projects with the European Space Agency, MATEREO’s PdM solution is based on the analysis of multiple remotely sensed datasets. Interferometric synthetic-aperture radar (InSAR) satellite data, combined with additional geological, structural, environmental and demographic data, is used to determine the structural integrity of critical infrastructures and surroundings and predict required maintenance actions. The main use of satellite technology enables MATEREO to provide geographically spread critical infrastructures, such as the railway solution in Brazil that covers 20 square kilometers in one solution with minimal need for on-site sensors.

Senseye

Product or Portfolio Overview

Senseye, a private company founded in 2014 and headquartered in Southampton, United Kingdom. It provides a suite of PdM products and services, including PdM Complete, PdM Enterprise and PdM Omniverse, to address the various stages of PdM maturity and challenges faced by industrial clients. Clients include Alcoa, Nissan North America, Nissan Europe, Smurfit Kappa and TATA.

How Senseye Competes

Senseye stands out in the field of PdM providers in three distinct ways. First, the PdM Suite addresses different needs and requirements of PdM clients at different stages of maturity — for example, from the initial data capture and analysis needs to more comprehensive service and training to enable self-service PdM. Second, Senseye has partnered with recognized industrial partners, such as Bentley Systems,

FANUC, PTC, Siemens and Schneider Electric, to drive joint value propositions with rapid deployment and support to multiple sectors. Finally, and notably, Senseye has launched ROI Lock as part of PdM Complete. Backed by SCOR, a global reinsurance provider, ROI Lock limits risk for clients by delivering a full refund on software investments if agreed ROI is not achieved in a 12-month period.

Worldsensing

Product or Portfolio Overview

Worldsensing, a private company founded in 2008 and headquartered in Barcelona, Spain, provides critical asset monitoring and PdM solutions for companies in the mining, construction, rail and structural health monitoring industries. Its Loadsensing solution combines the collection of near-real-time geotechnical, geospatial and structural data with remote device management and network monitoring, while enabling engineers to perform visualization and analytics tasks to track the performance of critical infrastructure. Worldsensing is a leading provider of sensor connectivity and data collection in remote and hard-to-access environments.

How Worldsensing Competes

Worldsensing started as a broader IoT technology and service provider for smart cities. It quickly identified that its industrial monitoring technology and early customer successes in mining allowed the company to develop a strategy with a strong focus on mining, construction and infrastructure. Today, this strategy provides Worldsensing with a differentiated and successful go-to-market approach for these sectors. Worldsensing serves such customers and partners as Tetra Tech in Brazil for tailing dams, the Florence City Council for the Ponte Vecchio bridge in Italy and the U5 Metro Line Extension consortium in Germany.

References and Methodology

This document is based on a number of vendor briefings and interview sessions, conducted with 12 vendors in the first half of 2021. This research was supplemented with data and insight captured from other interactions with other providers, as well as end users during the course of Gartner client interactions. Gartner's Secondary Research Services analyzed publicly available information to develop this landscape. Sources of information include published company announcements, announced deals and financial reports. Gartner's conclusions about competitive positioning consider these inputs but ultimately reflect our judgment based on Gartner's overall perspective on the market.

Recommended by the Authors

Magic Quadrant for Industrial IoT Platforms

Critical Capabilities for Industrial IoT Platforms

Partner for IoT Data Interoperability When Building Industrial IoT Applications

6 Critical Changes That Affect the Future of Asset Maintenance

Market Guide for Asset Performance Management Software

Gartner

Market Guide for Enterprise Asset Management Software

How IT Standards Can Be Applied to OT

The CIO's Role in Supporting Industrial Assets