5 High-Impact Use Cases Using Digital Knowledge Technology to Optimize Field Service Processes

- Field Service Profitability
- Part Order Optimization
- Turbine Service Calls
- Pump Failure Prediction
- Turbine Shutdown Prediction
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Unlocking Competitive Advantage with Digital Knowledge Technology

Technology plays a vital role in field service operations today. Most likely, your organization is already using a variety of platforms and applications to understand customer histories; track agreements, service-level agreements (SLAs) and service consumption; schedule appointments; provide call-center based support; capture and share knowledge; manage parts inventory; and more. And assuming you are monitoring equipment and other assets using built-in sensors, you are capturing streaming data about the current status of assets.

Collectively, these systems generate huge volumes of data in a variety of formats: think sensor data generated by equipment, text data from technician notes and job reports, structured data stored in systems like ServiceMax and SAP and voice data captured through call centers. In most cases, these types of structured and unstructured data reside in multiple, disconnected data silos.

The question is, how can you harness all of this data to optimize field service assets and processes?

According to a recent Accenture/GE study, a growing number of industrial companies are using big data analytics and the Internet of Things (IoT), sometimes referred to as the “Industrial Internet”, to realize greater efficiency and profitability in two major areas: asset and operations optimization. For instance, by gathering and analyzing vast volumes of machine sensor data, companies can implement predictive maintenance of equipment, which can dramatically increase equipment uptime and reduce costs.

Even small improvements can yield big savings, as just 1% improvements in OPEX can result in hundreds of millions in savings. For example, General Electric is using the Industrial Internet to increase the fuel efficiency of a gas turbine fleet. Just a one percent increase in fuel efficiency will save the company upwards of $6 billion in fuel savings per year.1 And a 1% improvement in oil recovery is worth 80 billion additional barrels per year. That equals billions in additional revenue. Or avoiding just one day of downtime in an offshore platform can prevent $7 million per day in lost production.

Given these kinds of potential impacts, it’s no surprise that in a recent Accenture survey, nearly 90% of companies indicated that big data analytics is either their top priority or among the top three.2 And nearly three-quarters believe that big data analytics has the power to shift the competitive landscape for their industry in the next year.

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Exploring the Value of Analytics to Optimize Field Service Operations

In field service management, data analytics, IoT and machine learning technologies have the potential to optimize key assets and business processes by:

- **Predicting equipment failures** – by analyzing streaming data and alerts from sensors, historical asset break/fix records and other data
- **Reducing unplanned downtime** – by enabling proactive maintenance that heads off issues
- **Reducing the number of unnecessary parts ordered and returned** – by helping technicians identify the correct parts needed to complete specific kinds of jobs
- **Matching the right technicians to each job** – by analyzing skill sets and experience levels needed to complete jobs efficiently and accelerate customer payment

Simultaneous Data Analysis Across Silos: Vital to Success

But to realize these benefits, you need a way to analyze all of your fieldservice related data simultaneously. Most organizations are swimming in data, but their analytical tools can only analyze data in silos or a limited number of data sources.

This severely limits the kinds of insights, correlations and patterns that analysis can yield, and thus the potential business value of those insights. Take analysis of data related to field service management, for example. These processes are ripe for transformation through strategic use of big data analytics. Most industrial firms are generating massive volumes of data from the field service automation, work order management, fleet management, sensors on equipment and other solutions they have already deployed. Yet one of the biggest challenges of field service organizations is the vast number of data silos, where data related to service and maintenance resides, from HR and travel to training, text documents, sensor data, time series data and more.

Only a big data solution that can take all of this data and analyze it simultaneously can uncover unexpected correlations and patterns across silos of data. This is what yields insights that can be used to improve processes, make better decisions and more.

How Maana Can Help

Maana has pioneered the Maana Knowledge Platform™, a knowledge-centric technology that solves the most complex operational challenges of Global Fortune 500 industrial companies. The Maana Knowledge Platform turns human expertise and data into digital knowledge for employees to make better and faster decisions. This eBook, explores the top five high-impact use cases to optimize field service processes. For example, for offshore and major turbines, our customers are seeing results such as:

- 67% reduction in unnecessary parts ordered for field service maintenance
- 5% reduction in major asset downtime

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As illustrated in Figure 1, Maana’s patented technology analyzes data across multiple silos to give a holistic view of assets and business processes and generates insights from data in multiple silos—simultaneously. In addition, it enables customers to operationalize big data insights and recommendations into line-of-business applications, which empowers thousands of employees to make better decisions every day. As a result, companies can optimize key enterprise assets and business processes.

Figure 1: Maana provides a holistic view of assets and business processes to be optimized.

Exploring 5 High-Impact Field Service Use Cases

The following use cases—all based on real Maana customer experiences—illustrate some of the ways that industrial and healthcare equipment companies are using Maana’s analytics platform to optimize field service assets and business processes. As shown in Figure 2, these use cases focus on:

- Improving field service profitability
- Predicting equipment failures and proactively addressing root causes to prevent unplanned downtime
- Reducing the number of unnecessary parts ordered by field service engineers

Enterprises Using Maana Can:

- Gain a holistic view of assets and business processes from data across multiple silos
- Operationalize big data insights and recommendations into line-of-business applications for thousands of employees to make better decisions
- Optimize key enterprise assets and business processes with insights from data in multiple silos—simultaneously
Figure 2: Maana supports a variety of use cases for field services organizations.

Field Service Profitability

A Fortune 50 company that manufactures and maintains industrial equipment wanted to increase the effectiveness and profitability of its field service organization. Using manual ETL processes to create a dashboard, management was only able to track a limited number of key performance indicators. The data they needed to gain insights, plan jobs more effectively and assign resources optimally was housed in 10 disparate silos and applications, making it nearly impossible to access and analyze them together. So they were unclear exactly what factors were impacting field service profitability and effectiveness and what changes they could make to reach these goals.

This company needed a big data analytics tool that could analyze data across silos – simultaneously – and generate insights that would help them increase billable hours and reduce overall costs through efficiency improvements.

Analyzing Data Simultaneously Across Data Silos

To meet these needs, the company used Maana’s analytics platform. As illustrated in Figure 3, Maana crawled 10 different data sources, such as:

- SAP ERP for revenue and invoicing data
- ServiceMax field service software
- Travel Hub for data on dates and costs of technician travel to customer sites
- Applied time reports for time per field engineer
- HR data, such as each technician’s location, their tenure and years of experience
Training completed by field engineers
Net Promoter scores for measuring customer satisfaction
Operations activity reports
Customer data in Salesforce.com
Weather data

FIELD SERVICE PROFITABILITY

Using insights from Maana, the company can:

- Determine factors that drive job efficiencies
- Identify correlations between job efficiencies and field engineers
- Recommend the right field engineer to staff each job type
- Operationalize Maana recommendations directly in their field service software
- Identify recurrent repairs made to the same equipment

Identifying Root Causes of Inefficiencies

Maana analyzed multiple data sources simultaneously to identify hidden correlations and unexpected insights. The first phase of analysis focused on the relationships between data on field service engineers, the geographic location of customers and their major equipment and the efficiency of engineers when working on different product lines. Maana’s analysis provided the company with a clear understanding of:

- The location of field service engineers employed by the company
- The skill set, years of tenure and hours of training for each field engineer by region and city
- Correlations between field service efficiency and productivity by region relative to amount of annual training and years of tenure each engineer has with the company
Maana analyzed all of this information simultaneously to generate insights into job inefficiencies. Maana found tens of thousands of dollars in unbillable travel time; as the company lacked sufficient service engineers in certain regions and was paying to fly staff from other regions to these job sites. By hiring new staff in these areas with the right skills and experience, they could eliminate most of these costs and service customers faster and more effectively.

In addition, Maana identified geographic areas where the company had invested heavily in training of new technicians, but that investment did not translate to higher customer satisfaction. The analysis revealed that technician experience – not just training – was critical to efficiency and effectiveness, and that region had the lowest tenured field engineers. By ensuring that the local staffing mix for all geographies included sufficient numbers of experienced field engineers, the company can now substantially increase job efficiency and customer satisfaction.

Finally, the company used Maana to create a data-driven process for assigning technicians to each job. Maana analyzed what skills and experience levels had historically correlated with the fast, efficient completion of different types of jobs on each kind of product. The new matching process ensures the right field engineer is assigned to the right job, increasing efficiency, profitability and customer satisfaction.

Understanding Barriers to Profitability

Maana also identified barriers to field engineer productivity and profitability by correlating service profitability by type of service call and by product type. This analysis revealed which product lines generated the most service problems or repeated service calls and why. For example, the company learned that:

- After a major software upgrade to a specific turbine model, the company experienced a spike in the number of alarms (due to downtime) and customer calls to the call center
- Certain product lines were generating the majority of service tickets or repeated service calls
- Profitability varied by type of field services (for example, fixed rate service vs. hourly billed services)

The next phase of this project will translate key findings into operational recommendations that are expected to increase field service profitability by $6-$10 million per year.

Part Order Optimization

A multi-billion dollar division of a Fortune 100 company that manufactures and operates medical diagnostic equipment wanted to improve field service efficiencies by reducing unnecessary parts ordered by field engineers associated with customer service calls. Unnecessary parts ordered were tying up cash to the tune of $30 million per year. By ensuring workers brought the correct parts with them to complete each job, the company could boost profitability and customer satisfaction.

Maana pulled in data from XELUS, the company’s service inventory management and demand planning software, and SAP ERP to understand the root cause of why 55% of parts ordered were unnecessary. Further analysis identified that a subset of field engineers – just 5% – located in Asia PAC had a 95% return rate on parts ordered for maintenance and repairs of medical equipment.
To minimize future parts returns, Maana was used to optimize the parts ordering process for field engineers. Maana crawled multiple data silos to identify and recommend the parts that would most likely be needed to address specific device and customer issues. Recommendations are based on an analysis of past service issues and the parts that were used to successfully address similar service calls. Now field technicians can verify the correct, complete parts to order for each job, as well as additional parts related to the main parts that may be needed, thus minimizing part returns. At the same time, technicians can resolve customer issues on the first visit.

Maana's insights and recommendations have reduced part orders that go unused from 33% to 11%. The company has also realized additional savings through reductions in customer service trips, part returns and inventory and shipping costs.

Pump Failure Prediction (Oil and Gas)

Oil pumps are critical to the efficiency of oil wells. When a pump fails in an oil well, it’s very costly to remove and replace the part. It involves not only stopping oil production but also mobilizing costly, specialized personnel and equipment to pull the pump out of the well and replace it with a new one. These pumps are designed to work in harsh environments like oil wells, but choosing the right pump for a specific well’s geologic and environmental condition is very complex. The right pump can operate for a longer period of time without costly interventions.

So it’s no surprise that a Fortune 20 company wanted a solution to help maintenance employees choose the right pump and anticipate failures likely to occur, in order to implement an effective predictive maintenance strategy. Maintenance experts used Maana to collect data regarding existing pump operations from a variety of sources (such as run and pull reports, pump failure reports, pump sensor data, and high frequency data flows) and analyzed it to predict the likelihood of pump failure.
Much of the data related to the inspection of failed pumps was entered by people in the field describing what they saw when they retrieved failed pumps from wells. In addition to the language-based data, the company also had highly detailed sensor data from pump operations. Maana was able to use both machine data and human language to help the company understand the causes of pump failures. Maana crawled and indexed these disparate data sources, brought them together and provided an interactive exploration environment that the company’s subject matter experts can use to validate various hypotheses related to failures and their causes.

![Pump Failure Prediction Diagram]

**Figure 5: Maana helped a customer accurately predict pump failures and implement an effective predictive maintenance strategy.**

With Maana’s user-guided machine assisted discovery, the company gained a holistic view of pumps that allowed them to:

- Choose the right pump to be installed in each kind of well
- Validate failure hypotheses
- Predict future pump failures
- Identify the causes of failures

Armed with these insights, the company can better choose the correct pump for each well and perform predictive maintenance that dramatically reduces pump failures and production downtime.

**Turbine Service Calls**

This Fortune 50 company sought to better understand the underlying reasons for customer service calls. To accomplish this, the company needed to gain more insights from data stored across multiple, disparate data sources.
Maana was deployed to identify the issues that prompted customer service requests. Maana crawled and indexed multiple data sources, such as global installed base data, turbine trip data, controller alarm data, parametric time series data and field service data from their ServiceNow system. The project involved over 600 million alarm values and approximately 1,200 trip events.

Maana used natural language processing (NLP) to identify the reasons why people called customer support. Maana’s machine learning capabilities enable subject matter experts to gain insights into the causes of turbine alarms. To do this, Maana found and identified correlations between historical patterns in customer support calls and trip events. The correlations showed obvious but previously unverified relationships between trips and support calls for various generator models.

These insights enabled the company to better understand the underlying triggers for customer service calls and determine which product lines and regions incur the most issues.

**TURBINE SERVICE CALLS**

![Diagram showing connections between data sources and customer service calls]

**BUSINESS BENEFITS**
- Establish correlations between customer service tickets and trips/alarms
- Identify what issues prompt customer service contacts
- Determine which product lines and regions incur the most issues

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**Figure 6: Maana crawled diverse data sets to identify triggers for customer service calls.**

**Turbine Shutdown Prediction**

A Fortune 100 company operating hundreds of turbines around the world began experiencing an average of two unplanned shutdowns per day. They wanted to reduce unexpected interruptions and mitigate production loss by anticipating potential shutdowns.

Maana enabled the company to navigate volumes of controller alarm data created by its 350 generators. As shown in Figure 7, this data was then combined with turbine specification data and turbine trip data to build a model that predicts imminent trips and alerts staff using alarms. The model draws correlations
between historical patterns in support calls and trip events. Now the company can detect unwanted events that could lead to turbine shutdown within 24 hours, gain insights into trip events and ultimately reduce the occurrence of unexpected shutdowns.

**TURBINE SHUTDOWN PREDICTION ON 350 UNITS**

![Diagram showing data sources and business benefits](image)

**BUSINESS BENEFITS**
- Identify alarm features associated with trips
- Gain insight into trip events
- Gain insight from a large volume of time series data

*Figure 7: Maana crawled diverse data sets to predict turbine shutdowns.*

**Why Maana?**

Maana is the Knowledge Platform for accelerating enterprise profitability. The Maana Knowledge Platform turns human expertise and data into digital knowledge for employees to make better decisions faster. Maana’s breakthrough invention is its patented Knowledge Graph™, which combined with Maana’s algorithms, expedite extracting knowledge from data silos and information sources, to reveal their relationships in the context of optimizing assets or decision flows. Enterprises such as GE, Chevron, Maersk and Shell are increasing profitability with Maana by operationalizing insights into line-of-business applications for thousands of employees to make better and faster decisions.

**A New Generation of Technology for Increasing Profitability**

Maana’s software platform is the most comprehensive solution with unique capabilities that solve the most complex challenges of Fortune 500 companies, without requiring an army of professional services. Compared to all data-centric solutions available today, the Maana Knowledge Platform takes a revolutionary approach by focusing on knowledge and reasoning.

Companies can use Maana to easily organize their siloed data into new knowledge for iterative data discovery and insights.
Maana’s user-guided, machine-assisted approach makes it easy and intuitive for subject matter experts to find and draw correlations between data from disparate sources.

Figure 8: The Maana Knowledge Platform turns human expertise and data into digital knowledge for employees to make better decisions, faster.

Maana’s user-guided, machine-assisted technology empowers subject-matter experts (SMEs) to extract the most relevant information from silos and understand the relationships between entities, concepts and data for optimizing an asset. SMEs can quickly find answers through search and exploration, drill down, filtering and interactive visualization and collaborate with business analysts and data scientists.

This new generation of digital technology uses advanced algorithms and deep learning to expedite developing, enriching, classifying and constructing knowledge, in the form of models, that represent various aspects of the business.

**Powerful Core Capabilities**

Maana’s comprehensive platform supports the following capabilities:

- Data understanding and integration
- Statistical understanding and analytics
- Solution modeling
- Operationalization of insights into line-of-business applications
Data Understanding and Integration

Maana examines various data types to understand data shape, connection and relevant information and provides key capabilities for users to easily prepare and join various data types for iterative data discovery. Maana’s powerful knowledge representation integrates structured, semi-structured, unstructured, time series, sensor, events, multimedia and categorical information from multiple sources. Its flexible data and knowledge modeling functions build a dynamic, evolving knowledge graph of key assets and all related information. Maana’s dynamic insights are continuously refreshed and extended with incremental data sources and updated data.

Statistical Understanding and Analytics

Maana enables users to formulate solutions through advanced machine learning algorithms and analytics using techniques such as temporal co-occurrence, which finds relationships between events that happen together in time, or clustering of temporal entities based on configurable distance metrics. Maana uses topic modeling to cluster the results, and its similarity search capability finds similar entities based on exemplars and a set of user-defined features. Maana’s advanced analytics also include automatic feature extraction, simulation and predictive models.

Solution Modeling

Maana enables programmatic data access, manipulation and data enrichment using languages and tools that data scientists are already familiar with, such as Spark, Scala, Python and R. Its custom machine learning algorithms leverage features from the underlying data to easily build a predictive model. Maana’s solution modeling also enables time series analysis and distributed compute to rapidly analyze large volume of data.

Operationalization of Insights into Line-of-Business Applications

Maana provides ongoing insights and recommendations directly into the line-of-business applications so that thousands of employees can make insight-driven decisions. Once embedded into the line of business applications, Maana learns and adapts from the actions of subject-matter experts and provides new and additional insights and recommendations. In addition, Maana’s Executive Analytics measures the improvement in KPIs that a business sees as a result of Maana’s ongoing operational recommendations.
Learn More

To learn more about Maana, please visit:
http://www.maana.io/industrial/ or email
us at sales@maana.io to request a live demo.