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9 AI-Driven Apps that Accelerate Digitalization of Oil & Gas Operations

Mitigate Oil Corrosion Risk

Blending Optimization

Demand Forcasting

Health & Safety Risk

Cyber Security

Phishing Detection

Pump Failure Prediction

Well Life Cycle

Piping Consolidation

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Unlocking Competitive Advantage with Digital Knowledge to Increase Profitability

Oil and gas companies have enjoyed decades of profitability, but the dramatic drop in the price of oil is creating a greater need for operational efficiencies. To do this, businesses need to streamline operations, maximize equipment uptime and optimize the performance of current assets. This requires finding ways to improve efficiencies and plan more effectively. In addition, the financial and resource requirements can be incorporated to reduce risk of well abandonment liabilities.

Complicating matters is the fact that just when oil and gas firms need their best and most experienced employees to realize these lofty goals, large-scale retirements are looming. "The demographics within the industry are alarming. According to the research firm IHS, the average age of the industry's professional workers rose from 43-years-old in 2000 to nearly sixty by the year 2012."[1] So it's vital that oil and gas firms find ways to document and make searchable the expert knowledge of seasoned staff before they retire.

The good news is the equipment, networks and workers are producing petabytes of time series, sensor, seismic and text data that can be combined with maintenance logs and structured data to produce valuable insights for predictive maintenance, asset performance optimization, job safety, knowledge management and more. As explored in this eBook, digital knowledge is helping companies harness this data to increase oil production and reduce operational expenses by improving well risk assessment, offset analysis, reliability metrics and equipment failure predictions.

Consider the impact of implementing predictive maintenance for wells and equipment, analyzing data to identify where failures in assets will likely occur and proactively heading off failures with predictive maintenance; these steps dramatically increase equipment uptime and reduce operational costs. Even small improvements can yield big savings, as 1% improvements in OPEX can result in hundreds of millions of dollars in savings. For example, General Electric has reported that just a 1% improvement in oil recovery is worth 10 billion additional barrels per year—the equivalent to billions of dollars in additional revenue.[2] And avoiding just one day of downtime on an offshore platform can prevent $7 million per day in lost production.[3]

Given these kinds of potential impacts, it's no surprise that in an Accenture survey, nearly 90% of companies indicated that big data analytics is either their top priority or among the top three.[4] And nearly three-quarters believe that big data analytics has the power to shift the competitive landscape for their industry in the next year.

For oil and gas companies, just 1% improvements in OPEX can result in hundreds of millions of dollars in savings.

1   http://www.pennenergy.com/articles/pennenergy/2015/08/the-big-crew-change-what-is-it-and-how-to-prepare-part-1.html

2   J. Presley. (2013) ESP for ESPs Exploration & Production

3   http://www.utilities-me.com/article-3972-ge-drives-smart-utilities/

4   www.accenture.com/us-en/insight-industrial-internet-competitive-landscape-industries.aspx

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Exploring the Value of Digital Knowledge to Optimize Oil and Gas Assets and Processes

In the oil and gas industry, digital knowledge has the potential to optimize key assets and business processes by:

▶ **Predicting equipment failures** – by analyzing streaming data and alerts from sensors, historical equipment failure, maintenance records and other data

▶ **Reducing unplanned downtime** – by enabling proactive maintenance that heads off issues

▶ **Preventing cyber attacks** – by monitoring and detecting suspicious activity on networks and production lines

▶ **Improving safety** – by streamlining pre-job hazard analyses that prevent workplace hazards, worker injuries and illnesses

But to realize these benefits, you need a way to analyze all of your well and equipment-related data simultaneously. Most organizations are swimming in data, but their analytical tools can only analyze a limited number of data sources at a time and lack the ability to process multiple data silos simultaneously. In other cases, unstructured data such as text data can't be analyzed. This severely limits the kinds of insights, correlations and patterns that analysis can yield and thus the potential business value.

For example, most companies are generating massive volumes of data from wells and sensors on equipment and other assets they have already deployed.[5] Concurrently, drillers and maintenance staff add to the volume by documenting their observations and issues they are concerned about. But this potentially valuable data is often inaccessible or difficult to analyze because it's in a text format or locked away in data silos.

Only a knowledge platform can take all of this data, regardless of its size, format and type, and search for patterns and correlations, simultaneously. It then uncovers the relevant information and new knowledge for evidence-based decision making to enhance processes, drive well performance, improve investment decisions and more.

How Maana Can Help

Maana pioneered "knowledge technology" for the enterprise. The Maana Knowledge Platform turns human expertise and data from silos into digital knowledge for employees to make better and faster decisions. Digital knowledge is a network of models that provide continuous, actionable recommendations into key decision flows of the enterprise.

Our team has been working with Fortune 500 companies across diverse industries to help them optimize their assets and business processes, reduce costs and gain new efficiencies. This eBook, which is based on our experience working with oil and gas customers around the world, explores digital knowledge use cases using the Maana Knowledge Platform.

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5   "Big Data Can Make A Big Difference In Field Service." Field Technologies magazine. By Brian Albright. July 24, 2014.

As illustrated in Figure 1, at the core of the platform is Maana's patented Knowledge Graph™, which combined with Maana's AI algorithms, expedites extracting knowledge directly from data silos and information sources to reveal their relationships in the context of optimizing assets or processes. Maana represents knowledge in the form of models and the Maana Knowledge Graph is the network of models that are developed to optimize specific assets and decision flows.

Maana Knowledge Platform enables subject-matter experts (SME) to quickly build models that answer complex questions and extract the information needed to understand the relationships and interdependencies of business processes and assets across their organization. These models represent concepts, entities, properties, and relationships that SMEs and data scientists can reason over together.
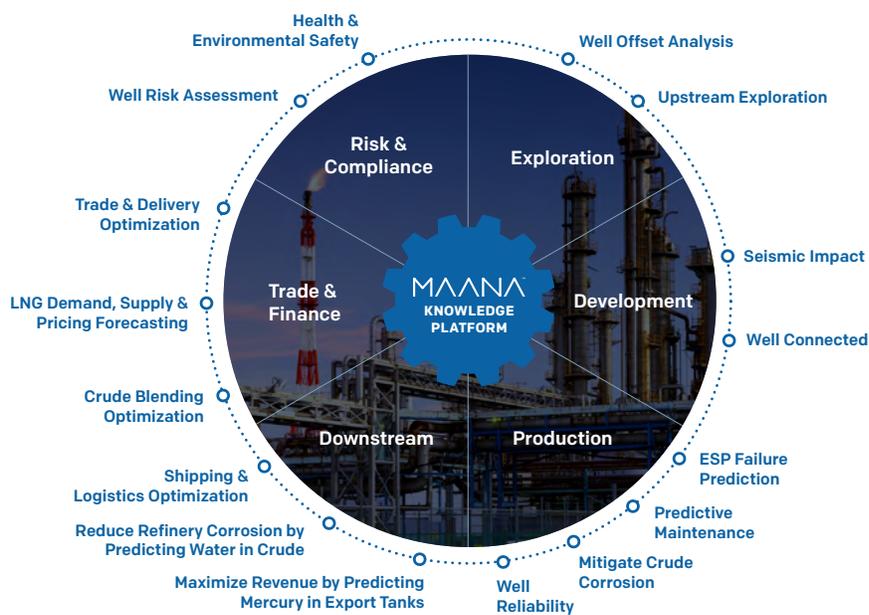

Figure 1: Maana provides a holistic view of assets and business processes to be optimized.

Exploring Use Cases for Oil and Gas

The following use cases — all based on real Maana customer experiences — illustrate some of the ways that oil and gas companies are using the Maana knowledge platform to optimize assets and business processes to make better, faster decisions for increased profitability. As shown in Figure 2, these use cases focus on:

▸ Improving well risk assessment and offset analysis

▸ Predicting equipment failures and proactively addressing root causes to prevent unplanned downtime

▸ Enhancing well reliability

▸ Improving job safety

With the Maana Knowledge platorm, oil and gas companies can explore their data interactively and use it to optimize key assets and improve upstream and downstream processes, resulting in billions of dollars in capital and operational savings.

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Use Case #1: Sharing Knowledge to Mitigate Oil Corrosion Risk

Business Challenge

The downstream process of refining crude oil into a finished good involves many potential risks, from equipment failures to unplanned downtime. Corrosion engineers at a global Fortune 10 oil and gas company had gathered a great deal of knowledge about the refining process (for example, the chemical composition of the crude, how different types of crude respond to different environments and how to treat crude to avoid corrosion). But as these subject matter experts (SMEs) retired, the company struggled to capture and share their insights and knowledge with the broader engineering team. The impacts of poor knowledge sharing were significant and costly. Corrosion engineers, for example, are expected to mitigate risks associated with different types of crude. But when they encounter a new type of crude that they know little about, they can't perform a proper assessment, which leads to lost in productivity. This is also problematic because some kinds of crude can cause additional maintenance issues, resulting in costly unplanned downtime and corrosion failure.

Business Objective

Management needed to aggregate the data and knowledge of its employees about crude types and make it easy for onsite engineers to easily access this expert knowledge, on demand. They could then identify unknown types of crude they are working with and understand how to handle them effectively.

How Maana Helped

To address this issue, the company deployed the Maana Knowledge Platform, which crawled and indexed multiple, unstructured data sources, including refinery incident reports (in the form of word documents and PDFs, for example), information on the physical properties of the crude types and data on characteristics of incidents and refinery demographics. They then built a custom application – or knowledge base – on top of the Maana platform. They leveraged the platform's natural language processing capabilities to capture knowledge collected from previous engineers and aggregate it in one location.
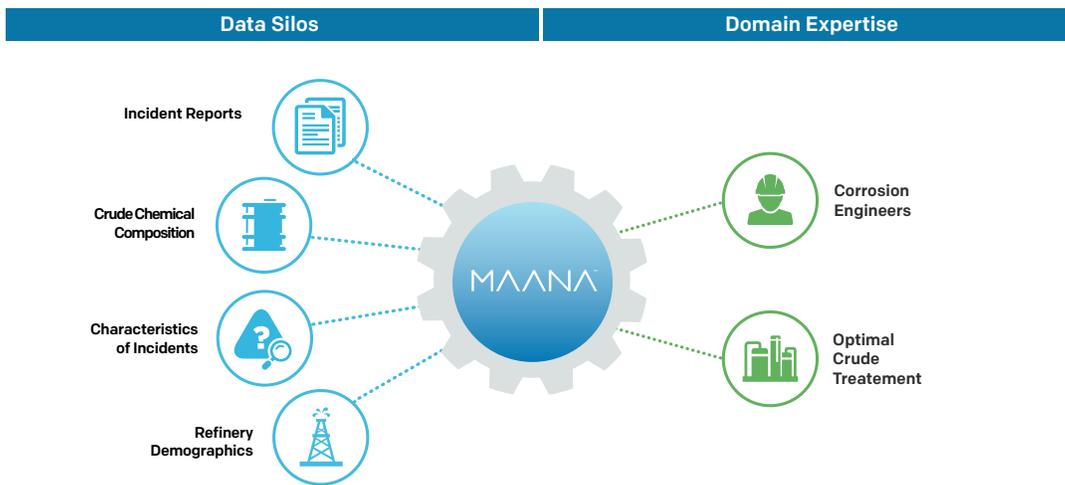
Results

Now, onsite engineers can easily access and use this knowledge base to identify the types of crude they are working with and understand how to handle them effectively. Using the application's intuitive user interface, corrosion engineers can easily search for a particular crude and discover all the relevant information related to it, including risks, lessons learned and risk mitigation strategies.

Using the Maana Knowledge Platform, a Crude Flex Knowledge Application was created for this use case which captures the expertise of subject-matter experts for use by all corrosion engineers. Using the various models stored in the Knowledge Application, the company's engineers can make decisions that reduce maintenance costs and unplanned downtime.

Enterprises Using The Maana Knowledge Platform Can:

▸ **Gain a holistic view** of assets and business processes from data across multiple silos

▸ **Operationalize insights** as recommendations into line-of-business applications for thousands of employees to make better and faster decisions

▸ **Optimize key enterprise assets** and business processes with new knowledge from data in multiple silos — and analyze it – simultaneously

Data Silos	Domain Expertise

Incident Reports

Crude Chemical Composition

Characteristics of Incidents

Refinery Demographics

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Corrosion Engineers

Optimal Crude Treatement

Figure 2: The Maana Knowledge Platform Reduced Crude Corrosion Risk and Downtime

Use Case #2: Optimized Blending of Refined Products

One of the largest oil and gas companies in the world blends petrochemicals in order to produce the right mix of refined products to meet market demand. This is a complex endeavor, as world markets for oil and gas have different regulations regarding the quality of these refined products. To meet diverse quality requirements, oil and gas companies must mix various grades and components of refined products and petrochemicals.

The company's trade organization makes trade commitments to supply certain grade products that meet product specifications based on market demand. They wanted to determine how to best blend base products into refined products to meet all trade commitments.

To address the problem, the company used the Maana Knowledge Platform™ to capture the domain expertise of the trading team and data from across various silos and created a Blending Optimization Knowledge Application that can quickly surface an optimal blending schedule. Using this Knowledge Application, the trading team makes accelerated, confident decisions regarding how to negotiate and execute on trades.

Business Challenge

The challenge for the trading team is finding the optimal set of ingredients to minimize costs while meeting the customer's exact specifications. Traders must decide how to blend products based on variables such as known commitments, short and long positions, current inventories, and the availability of inventories at other locations (even looking out a month in to the future). The options and permutations involved in determining the maximally profitable blending schedule to meet ever-changing market demand are too numerous to be solved using a deterministic approach enabled by linear programming, for example. They needed an efficient way to determine how to best blend base products into refined products to meet all trade commitments.

The primary complexity was the huge number of factors and correlations involved in scheduling blending to meet market demand for a given set of product quantities and specifications. These factors include:

▸ The availability of dozens of raw feedstocks, as well as their properties and price trends

▸ Supply and demand forecasts of the raw feedstocks across various geographies

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- The complex mechanics of blending itself, given that properties may combine by either linear or non-linear rules

- Location, as blending can happen at different locations with dozens of parameters that impact costs, schedules and the risks associated with shipping raw feedstocks

- Different regulations in different countries, which constrain what can be mixed depending on the destination of the shipment (for example, some countries do not allow the use of MTBE, methyl tert-butyl ether)

- Rules associated with the movement of components, the taking of samples for lab tests and measures needed to avoid cross-contamination of products

Business Objective

The objective of the project was to provide traders with a simulation application that would help them decide the best way to meet market demand for products in specific quantities and qualities, and do so much faster and with minimal resources and cost.

How Maana Helped

Using the Maana Knowledge Platform™, the blending officers – with the help of business analysts and data scientists – quickly built interconnected models for:

- Blending recipes and methods

- Blending venues and associated parameters

- Trade destinations and constraints on components and properties

- Current inventories (both short and long positions

Maana enabled these models to be built from various, siloed data sources containing structured and unstructured content from sources such as:

- Ships datasheets

- The company's transaction system

- Industry portals (Reuters, Platts, Worldscale, etc.)

- Ports details (in PDF format)

- Blending models

- The company's email system

These models were then connected to create a Blending Optimization Knowledge Application that allows trade decision makers to perform simulations and answer 20-30 questions related to blends, specifications, commitment positions and feedstock tanks. Examples include:

- Given a set of current inventory data and short and long positions (both supply and demand), what is the best blend plan to meet the demand (specifically, the short positions) while minimizing give-aways?

Well Offset Analysis

Customer: A Fortune 100 oil and gas company

Challenge: Improve well planning by aggregating fragmented, diverse data sources and analyzing it to generate timely insights that enable faster, better decisions.

Business Objective:

- Provide drilling engineers with a complete view of all well offset data in one searchable location.

- Empower decision makers to analyze well sensor data to detect events such as kicks, lost circulation and other drilling problems.

How Maana's Knowledge Platform Helped:

- Streamlined and improved offset well analysis.

- Used natural language processing and machine learning capabilities to index data, make connections between the datasets, run analytics and render the data searchable and relevant.

Result:

- Provided better offset data needed by drilling engineers to plan new wells.

- Identified wells with kick events by analyzing rig sensor data

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- Given a blend plan, what is best product movement schedule?
- What commitment positions cannot be met with existing inventories?
- What components need to be purchased to meet trade commitments?
- What is the internal cost to produce the blend?
- What is the inventory at each point of time during the plan period?
- What excess feedstock can be traded?

The network of models developed to answer these questions – and create the Blending Optimization Knowledge Application – also provides recipe recommendations for blending, thus empowering the company's trading team to meet their commitments more quickly and more profitably.
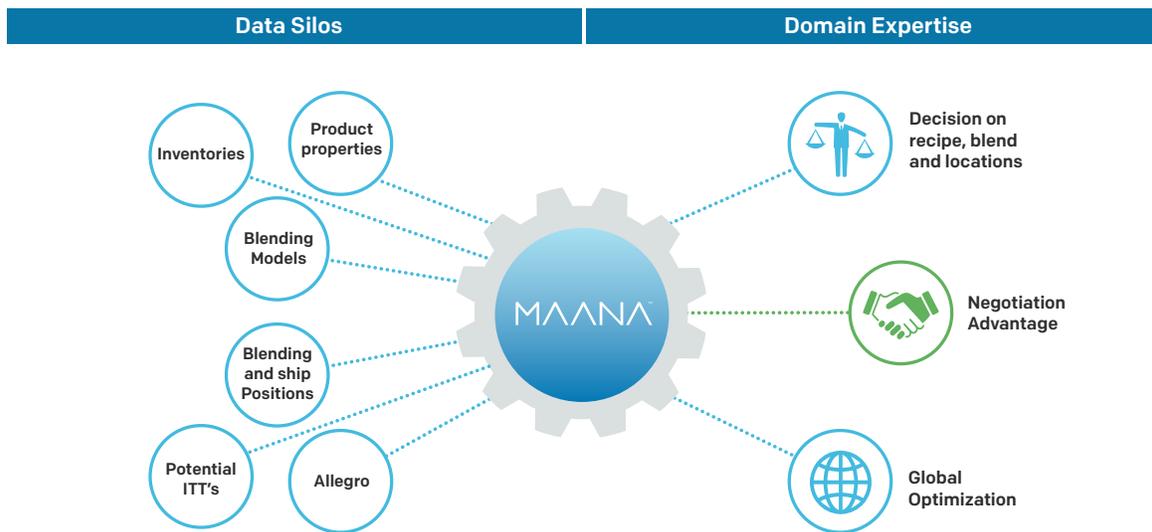
Figure 3: The Maana Knowledge Platform empowers the trading team to meet commitments quickly and more profitably.

The Results

By using the Maana Blending Optimization Knowledge Application, traders and blending schedulers can promptly and thoroughly evaluate various scenarios based on commitments made, tanker availability and inventory at hand. The insights gained enable them to quickly determine the best crude blending recipes, methods and locations for optimum blending to satisfy customer requirements now and in the near future, while maximizing profitability. The solution will also help protect the company's reputation for delivering on their commitments and ensuring the quality of their refined oil products.

Use Case #3: Demand Forecasting for Liquid Natural Gas

A multinational Fortune 50 energy company uses market analysts to forecast liquid natural gas (LNG) supply, demand, and pricing. To maximize revenues; it was essential for the company to make predictions accurately for specific global markets. Using the Maana Knowledge Platform™, these analysts were able to create a simulation knowledge application that enables them to analyze each geographic market, in any given month quickly, and determine the demand, supply, and best pricing to maximize revenue and meet contractual commitments.

Business Challenge

The company currently trades in 10+ liquid natural gas markets. To determine demand and pricing for each market, the analysts relied on cumbersome manual data aggregation. Gathering data from 10 different external subscription sources they performed time-consuming analysis using complex spreadsheets. As a result, analysis took a tremendous amount of time and did not leverage all market data, such as stock price, political landscape data, and commodity trading regulations.

Business Objective

The trade organization of this energy company wanted to identify incremental revenue by accurately predicting demand, supply and pricing for each specific market. To do so they wanted a more efficient way to enable market analysts to perform scenario analysis on the latest projections of LNG supply, demand, and pricing that would be impacted by market changes as well as a diverse set of external factors, such as weather, government policy, economic forecasts, and more.

How Maana Helped

Using the Maana Knowledge Platform, the company created a simulation knowledge application that allows interactive exploration of demand, supply, and pricing using internal data from across silos, as well as real-time market data for all 10+ major LNG markets. Data is continuously and automatically updated– including consumer LNG consumption, market data, consumer confidence, weather predictions, industrial production, and historical shipment data – so that analysts can quickly and accurately predict demand, supply, and pricing for each market.

In addition to leveraging various internal and market data, the Maana Knowledge Platform was used to encode the expertise of the company's market analysts and traders. Now, for any region or geographic market, an analyst can instantly:

▸ See all supply, demand, inventory levels, and news related to that region

▸ Drill down and get more details

▸ Perform scenario modeling, examining the impacts of new information or alternate projections

▸ Determine LNG delivery by month and supplier

Well Reliability Metrics

Customer: A Fortune 50 oil and gas company

Challenge: Accurately assess well performance by using actual well production data – not traditional speed and cost metrics – to measure well reliability.

Business Objective: Maximize drilling performance to boost profitability.

How Maana's Knowledge Platform Helped:

▸ Mapped and linked all historical well production data for a comprehensive, enterprise view.

▸ Combined historical drilling data with production data on a regional and global basis.

▸ Analyzed this data to understand well reliability, well failures and failure rates.

Result:

▸ Management can accurately identify wells that failed in the first year of operation, existing wells with the potential for failure in its first year, and common factors in failures.

▸ The company now understands common failure risks to multi-million dollar wells and how to reduce future infant mortality.
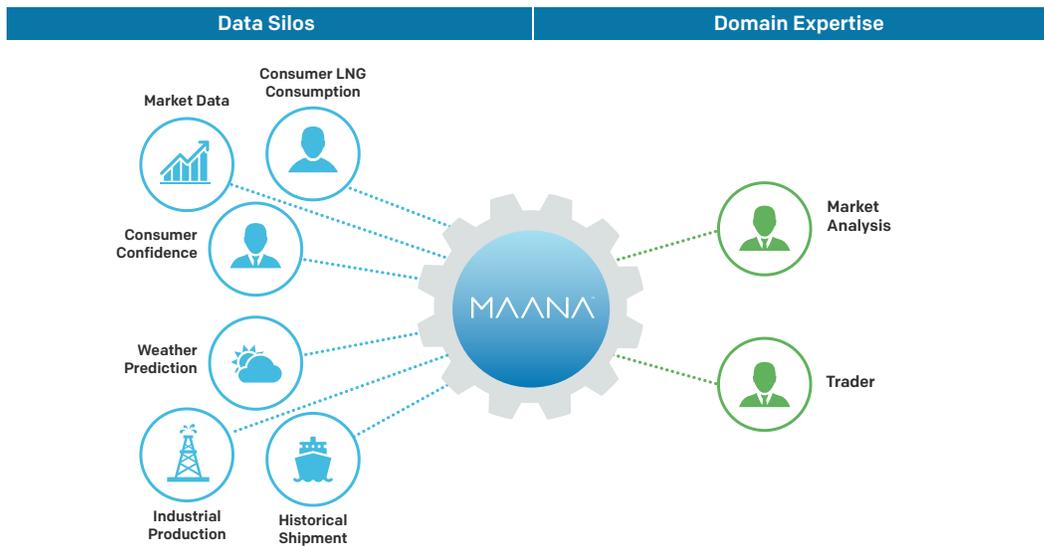
Figure 4: Maana Knowledge Platform was used to encode the expertise of market analysts and traders

The Maana Knowledge Platform uses its patented knowledge graph and AI algorithms to dramatically accelerate creating knowledge models that enable the customer to perform scenario analysis for each geographic market, in each month, and given supplier attributes. Maana's automated data mining, continually provides up-to-date market information with no manual effort and its machine learning algorithms improve forecast precision by actively updating models based on new incoming data.

The Maana Knowledge Application allows interactive exploration of data across all 10+ major LNG markets, using attributes such as:

▸ Markets: Delivery Year/Month, Country of Origin and Volume (metric tons)

▸ Contract: Market, Country of Origin, Supplier Name and Supply Volume

▸ Internal Systems: Market, Delivery Year/Month, Country of Origin, Supplier Name and Supply Volume

The Results

Now analysts can accurately predict demand by each market and use these insights to optimize pricing. Using the application, they can make better business decisions by quickly performing scenario modeling, examining the impacts of new market information or other projections on supply, demand, and pricing.

Use Case #4: Minimizing Health and Safety

The Health and Safety group at a global Fortune 100 oil and gas company had acquired a great deal of knowledge about safety risks, as well as job descriptions, codes, and mitigations across all areas of operations. Yet occupational hazards were always a looming threat for workers.

So management used the Maana Knowledge Platform to unify this information and create an intuitive application that allows anyone to enter a description of a task and receive information about all known risks and mitigations by probability, site and more.

Business Challenge

Occupational hazards are a constant threat for workers at inherently dangerous sites such as oil wells, refineries and storage facilities. To address these threats, the Health and Safety group at a global Fortune 100 oil and gas company collected a great deal of knowledge about safety risks, as well as job descriptions, codes and mitigations across all areas of operations.

But despite these efforts, the company's knowledge about risks was fragmented across various projects, groups and worksites. As a result, only a very small group of experienced workers at any given worksite were aware of the full range of risks workers faced. Without knowledge of these potential risks, the other workers couldn't take steps to mitigate them, resulting in increased worksite accidents and higher project administration and running costs.

Business Objective

Management needed a way to aggregate, index and analyze all organizational risk knowledge and make it readily accessible to the broader workforce through a unified application. Sharing this knowledge would empower all workers to proactively identify and mitigate risks.

At the same time, the right solution would help them overcome sizable technical challenges. For example, it had to:

▸ Handle significant volumes of structured and unstructured data, both internal and external, as well as data that was not integrated across formats and silos

▸ Support sophisticated analysis beyond basic statistics and probabilities

▸ Provide methods for surfacing the right data to employees

▸ Continuously learn and adapt over time

How Maana Helped

Management used the Maana Knowledge Platform to capture and unify risk-related information and create an intuitive application browsing experience that anyone can use. The platform captured information using its Natural Language Processing capabilities, processing internal and external sources such as Learning from Incidents PDFs and supplementary Hazard and Effect Management Process (HEMP) studies containing job codes, risks and mitigation recommendations.

Results

The result was a unified knowledge application (called the HSE Risk application) that empowers any worker – at any competency level and at any worksite – to enter a description of the task they must complete and receive vital risk-related information. The output may include a list of the most likely related job codes and all known risks and mitigations by probability. By giving workers easy, onsite access to this information, the company has reduced the number of jobsite accidents and lowered the overall cost of running a job at each worksite. As shown below, the Maana Knowledge Graph initially created for this use case captured the expertise of subject-matter experts for use by workers at worksites. Using the various models stored in the Knowledge Graph to understand and mitigate risk, the company's workers can now reduce on-site accidents and unplanned project costs.

This reusable asset is now being leveraged across the organization to rapidly build additional models for more than ten optimization initiatives across the enterprise – for example, around crude corrosion (to minimize risk and downtime), seismic activity analysis (to understand environmental impacts), and incident reporting (to help automate this process).
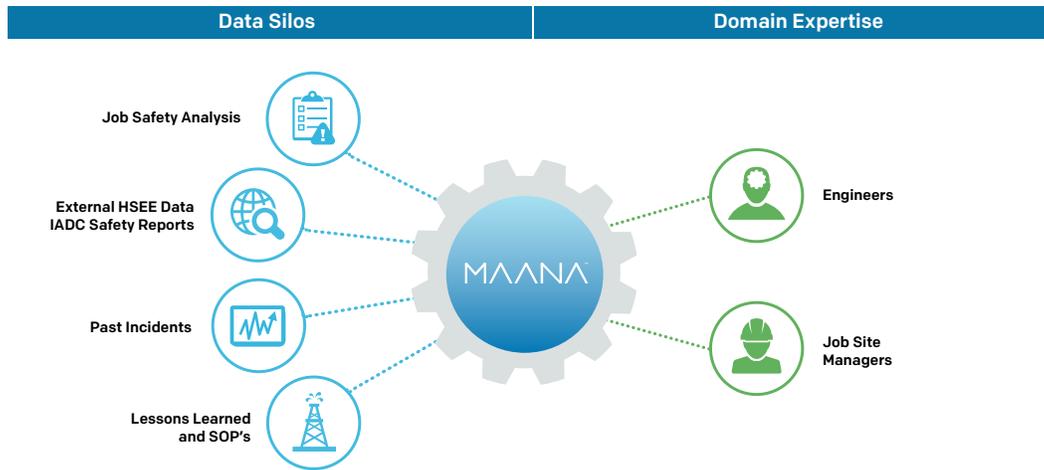
Figure 5: The Maana Knowledge Platform Mitigates Health and Safety Risks

Use Case #5: Cyber Security: Detection & Mitigation of Advance Persistent Threats

Business Challenge

A multinational energy company active in nearly 180 countries identified Advanced Persistent Threats (APTs) as a major business risk. APTs are extremely difficult to detect because for a number of reasons: data is large and disparate and often stored in semi-structured logs; signals are often hidden in large, noisy networks; and attackers intentionally disguise and change their activity, making it difficult to detect.

As a result, the company's cyber security data scientists were forced to spend inordinate amounts of time cleaning data, combining it, and chasing false positives. They used a highly manual, time-consuming process – powered by technologies such as MSSQL and Tableau – to respond to reports of suspicious trends in network intrusions or attempts.

Business Objective

In light of these issues, management wanted a new way to:

▸ Identify if specific employees or hosts (such as computers) are being targeted because they are more valuable or vulnerable to attackers

▸ Create a suspected incident investigation tool to enhance and accelerate the investigation of suspected incidents

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How Maana Helped

To address this need, Maana created a custom Victim Profile Knowledge Application that runs on the Maana Platform. Subject matter experts such as cyber security analysts and data scientists collaborated to capture different types of real-world security events and related victim types and traits. This human knowledge was then encoded into a Maana Knowledge Model to help users quickly identify specific events hidden in the data, including structured, tabular logs (parquet files) and semi-structured logs (text files), which subject matter experts identified as relevant.

This data and human knowledge was then modeled to create a custom line-of-business app, which people can now use to create a query that defines a suspicious trend in malware and/or malicious email detections. For example, Maana identified that for victim hosts (i.e. computers), attackers were interested in attributes that made that host more vulnerable, such as the type of host, the operating system running on it, and whether or not the host was fully compliant with pre-approved software. For victim users (i.e., accounts), they were interested in what might make that account valuable to an attacker; for instance, they would be interested in knowing the business unit a user works in (for example, accounts recievable) and his or her role (for instance, approver of invoices).

The Knowledge App automatically queries relevant events, associated victims and their traits, and then creates a control group. At the same time, the underlying Knowledge Model produces a score for each victim trait, suggesting how relevant that trait is for victims of a suspicious trend (relative to the control group). High trait scores mean the victim set is somehow distinctive and suggests they are either targeted or more vulnerable in some way.
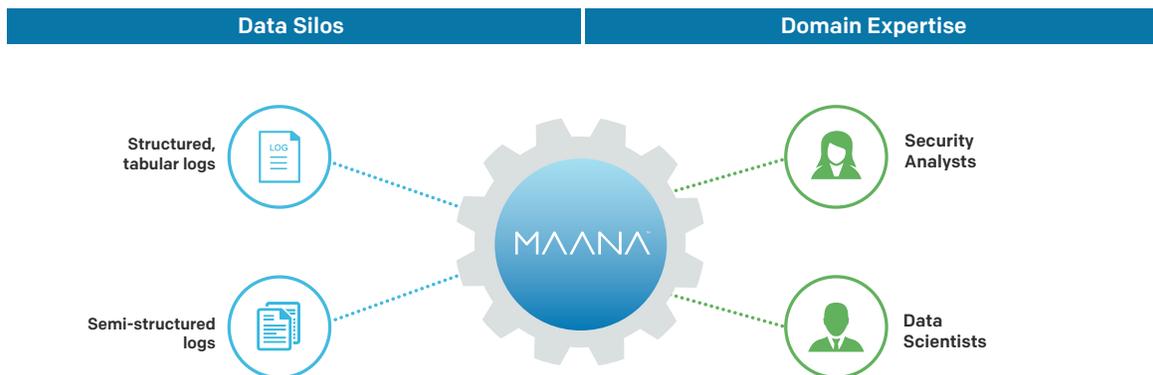
Figure 6: Maana Kowledge Platform helps security analysts and data scientists uncover threats faster

The Results

Now data scientists can understand whether specific trends are actually significant based on the victim data set, which helps them avoid spending time on false positives. They can also receive directional guidance on which correlations to dig into more deeply, allowing them to uncover more threats faster.

Armed with more sophisticated models, data scientists can improve the quality of business decisions regarding incidents and threats. They can, for example, focus investigations on the events most likely to be part of a targeted attack and the victim traits that matter. Moreover, they can do all of this faster. For example, the company reports that the Maana Knowledge App saves:

- ▶ Hours to days of data wrangling per investigation.
- ▶ Hours of ad hoc tableau creation.
- ▶ Hours spent investigating false positives.

And by helping security analysts and data scientists uncover threats faster and investigate incidents more thoroughly, Maana has reduced the risk of data leakage, legal fines, litigation, and data leakages, as well as protected the company's brand and high level of consumer trust.

Use Case #6: Cyber Security Phishing Detection

Cyber security breaches can lead to theft of intellectual property and consumer data, as well as orchestrated equipment and infrastructure failures. While network intrusion detection solutions are available, most focus on a specific problem and can't work across heterogeneous data sources or large data volumes or detect new and emerging threats.

To overcome these issues, a global oil and gas company used the Maana Knowledge Platform to enhance its cyber security detection capabilities. Now cyber security analysts can quickly identify phishing attempts and dramatically accelerate the time it takes to investigate and contain threats.

Business Challenge

A Fortune 100 oil and gas company wanted to enhance its cyber security capabilities. They suspected, for instance, that phishing attempts were typically sent from throw-away email addresses, targeted at small groups of employees and involved the use of different subject lines for each email to avoid spam detection. If they could confirm these types of hypotheses, cyber security analysts could configure their infrastructure to detect patterns, filter email traffic accordingly and funnel suspicious emails to investigative resources.

A proxy device was already logging basic metadata on every mail message passing through the corporate network. But this data was essentially unstructured, and with up to 40 events logged per email message and stored without order, it was impossible to analyze this data in its raw form.

Business Objective

Management wanted to give its cyber security analysts the ability to test their hypotheses about "exploratory" phishing attempts – quickly and efficiently – using a tool that could analyze all of its raw data.

How Maana Helped

Using the Maana Knowledge Platform's natural language processing capabilities, the company successfully identified hidden structural elements in this data; these elements included the unique ID number assigned to each mail message and aggregate unique log events for each email (such as date, time, domain address, sender and subject line).

Well Risk Assessment

Customer: A Fortune 100 oil and gas company

Challenge: Improve the accuracy of well risk assessments so that risks can be proactively mitigated.

Business Objective: Use fragmented sources of quantitative information to determine the accuracy of past predictions of project risk and improve future risk assessments.

How Maana's Knowledge Platform Helped:

- ▶ Enabled the risk assessment team to quickly access data from diverse systems and sources.
- ▶ Analyzed data for risk insights and answers to questions related to planned and unplanned risks.

Result:

- ▶ Uncovered new drilling risks, determined probabilities for first-year failures, and identified risk severity in different environments.
- ▶ Gave the team a more complete view of common failure factors and each drilling project's planned, unplanned and potential risks.

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Results

Using this aggregated log data, subject-matter experts can now assemble the concept of a unique mail message and represent the data in a form that can be analyzed. Business analysts then use the platform to research, analyze, investigate and prove their hypotheses and ultimately define the conditions under which email should be considered a phishing attempt.

Going forward, cyber security analysts can quickly identify phishing attempts and dramatically accelerate the time it takes to investigate and contain potential threats. The company plans to integrate the platform with the company's IT infrastructure so that new threat detection rules can be rolled out quickly across the enterprise.
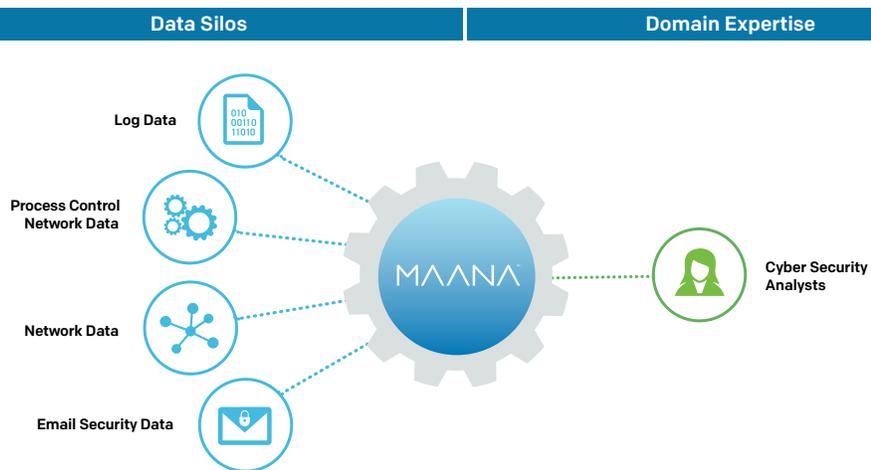
Figure 7: The Maana Knowledge Platform enabled cyber security analysts to quickly identify phishing attempts and investigate potential threats faster.

Use Case #7: Pump Failure Prediction

Business Challenge

When an oil pump fails, it's very costly to remove and replace the part, as it requires stopping oil production and mobilizing costly, specialized personnel and equipment to pull the pump out of the well and replace it. The challenge is selecting the right pump for each set of geologic and environmental conditions so it can operate for longer without the need for costly interventions.

Business Objective

This Fortune 20 oil and gas company needed a way to extract data from across silos and generate actionable recommendations to help make optimal pump selections, increase billable hours and reduce overall costs through efficiency improvements.

How Maana Helped

Maintenance experts use the Maana Knowledge Platform to collect data related to existing pump operations from sources such as run-and- pull reports, pump failure reports, pump sensors and high-frequency data flows. This data is then analyzed to predict the likelihood of a failure, choose the optimal pump for each site and implement an effective predictive maintenance strategy going forward.
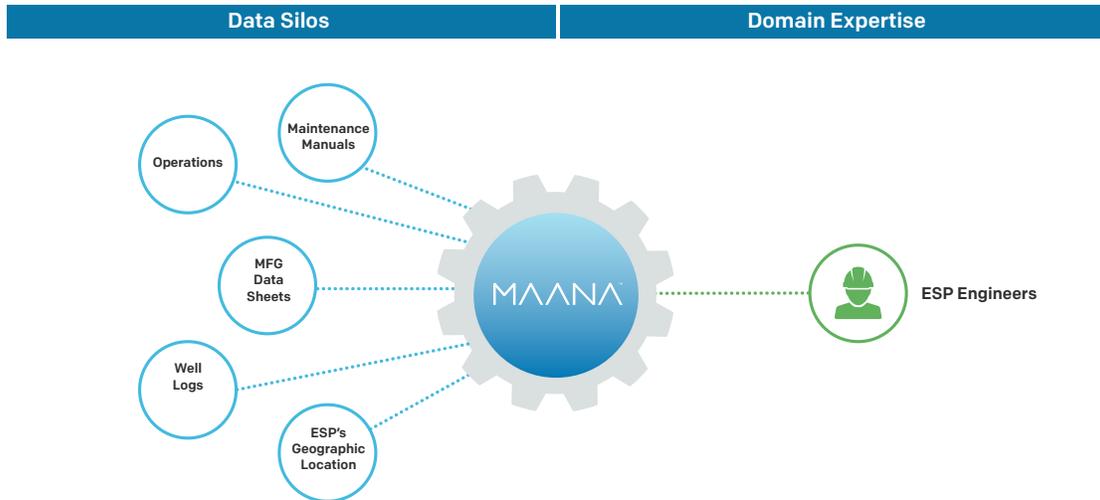
Figure 8: Maana Knowledge platform accurately predicts pump failures weeks in advance and enables the customer to implement an effective predictive maintenance strategy.

Result

Now the company can use its machine data and human language data to understand the causes of pump failures, accurately predict pump failures weeks in advance and implement an effective predictive maintenance strategy. This knowledge is also used to choose the correct pump for each well and perform predictive maintenance to minimize pump failures and production downtime.

Use Case #8: Digital Upstream for Optimizing Life Cycle of Wells

Business Challenge

Difficulty locating time-sensitive, critical information to make fast, informed decisions that impact a Fortune 500 company's customers – and the communities in which they operate – due to vast differences in document structures and decentralized storage locations.

Business Objective

Enable drilling, engineering and production operations to answer time-sensitive, business critical questions leveraging data from traditional and untraditional data sources.

How Maana Helped

Digital Upstream organized both structured data (for example, data within well and equipment management systems) and unstructured data (such as well documents) into a knowledge graph that enables entities to be indexed into categories such as wells, equipment, vendor, people and rock formations. Additionally, over 250,000 documents were ingested and classified to provide context for which these concepts were indexed. Classifications included AFE submittal, AFE detail, land summary, backup economics, well plat, wellbore schematic and geological prognosis.

During the classification process, the Maana Knowledge Platform revealed over a million connections between pieces of data – for example, the name of expert who has drilled in a specific location and in a certain rock formation using a particular piece of equipment. Now, teams planning for new wells in that area can identify which expert to ask for advice and see which type of equipment is best to use.

Using a custom user interface, subject-matter experts can also filter, view and download documents meeting specific criteria so they can quickly answer critical-business questions. In addition, using Maana's graph explorer, users can explore the knowledge graph by asking ad-hoc questions and discovering new relationships between the concepts in Digital Upstream. For example, now they can search for a certain geologist, see all the wells they were associated with, and leverage their knowledge to inform new well planning.
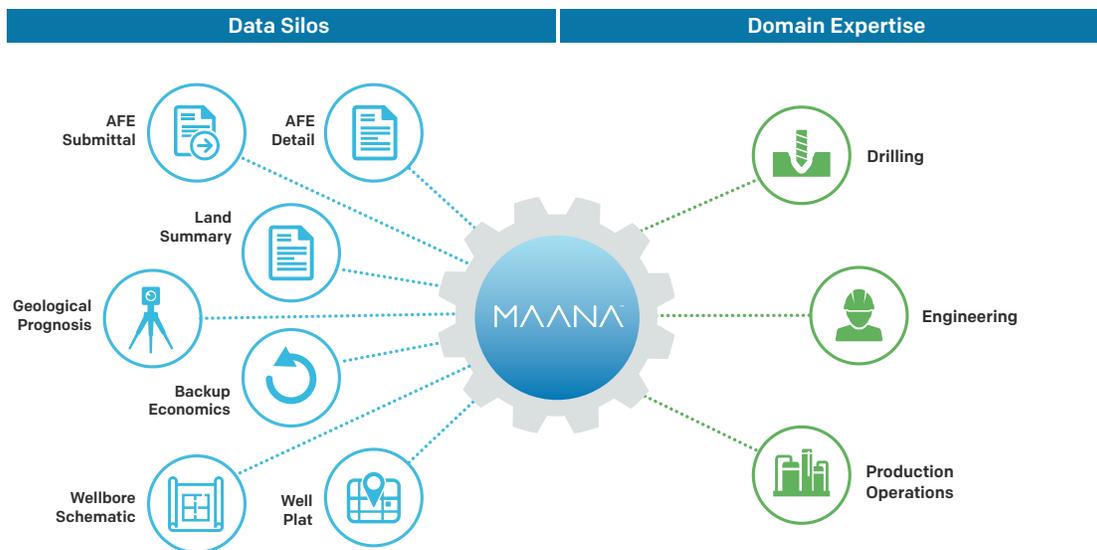
Result

In the past, drilling, engineering and production operations teams relied on files stored on SharePoint, and when searching documents, they were provided with a list of all related content – without context. Now, they can quickly search all types of data – structured and unstructured – view it in context, and easily find relevant, valuable information that helps them make better well planning decisions.

Use Case #9: AI Knowledge Model for Piping Consolidation

Business Challenge

Piping is a vital component of upstream and downstream facilities. It also represents a significant fraction of the investment in major capital projects. Proliferation of piping classes is common throughout the industry. Lack of standardization typically leads to unnecessary complexity, sub-optimum capital allocation in capital projects and operational risks.

Business Objective

To capture and augment the knowledge of a Fortune 50 oil and gas piping and valve SMEs in a 'knowledge layer' application, which can be used to systematically and efficiently consolidate piping classes.

How Maana Helped

A Fortune 50 oil and gas company has leveraged AI and machine learning capabilities to automate the mapping and consolidation of over 5000 piping classes. In addition, a consolidation algorithm encodes the knowledge from piping and valve experts to provide recommendations for creating new standard classes of pipes. The process of mapping and consolidation of piping classes which traditionally requires significant effort (up to 1 year per business unit)
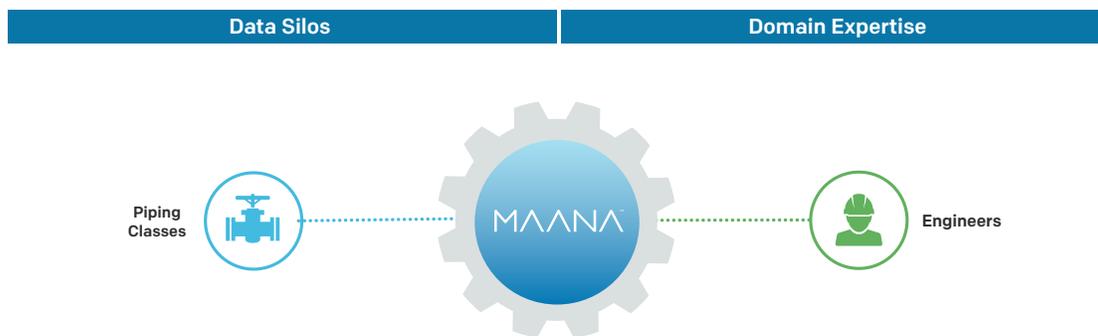
Result

Piping consolidation which used to take one year for one business unit, can be done in just a few days. Benefits go beyond financial savings to projects and operating assets. Lessons learned in this implementation, have also led to the realization that "Engineering Knowledge Models" can play a central role in the industry as they lead to better designs and safer operations.

MAANA

Maana: Delivers the First Digital Knowledge to Accelerate Digital Transformation

Maana pioneered "knowledge technology" for the enterprise. The Maana Knowledge Platform turns human expertise and data from across silos into digital knowledge for employees to make better and faster decisions. Digital knowledge is a network of models that provide continuous, actionable recommendations into key decision flows of the enterprise. Maana represents knowledge in the form of models and the Maana Knowledge Graph is the network of models that are developed to optimize specific assets and decision flows.
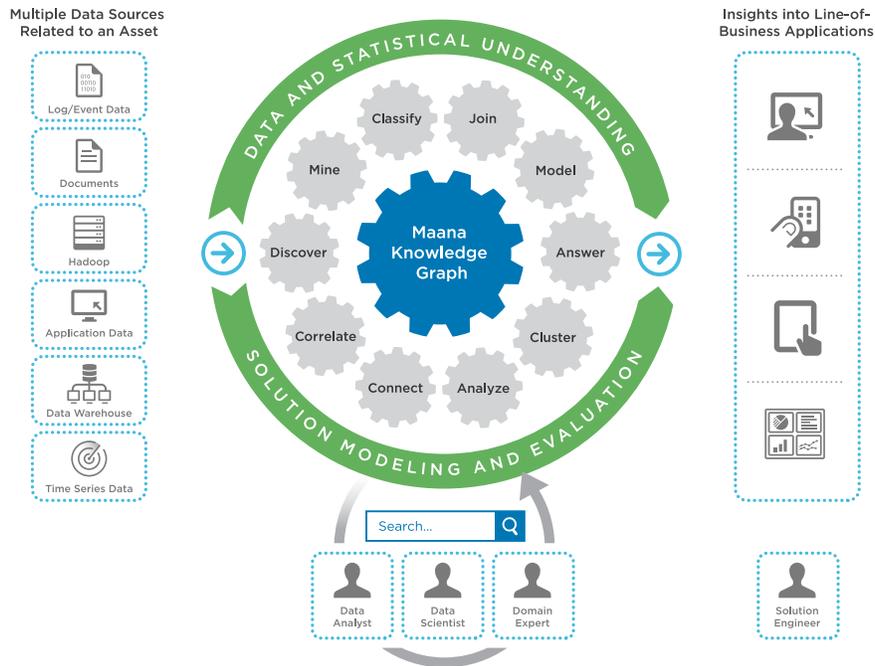
Maana Knowledge Platform enables subject-matter experts (SME) to quickly build models that answer complex questions and extract the information needed to understand the relationships and interdependencies of business processes and assets across their organization. These models represent concepts, entities, properties, and relationships that SMEs and data scientists can reason over together. The flexibility of the Knowledge Graph enables groups across an organization to leverage and build upon the initial Knowledge Graph, accelerating the development of hundreds of models for iterative collaboration. As more knowledge models are created, the Knowledge Graph expands, and time-to-value is accelerated even faster. All models are dynamic, so once they are operationalized into line-of-business applications, they learn and adapt based on user behavior, providing continuous intelligence for day-to-day operations.

The Maana Knowledge Platform includes a set of sophisticated AI algorithms that enable subject matter experts to quickly create models for faster decision making. Maana's approach to AI is drastically different than traditional big data. We begin with the problem, in the form of a precise question, which serves as the basis for a series of interconnected and reusable mathematical models. These models answer the precise question by capturing the observed and perceived relationships between business concepts.

Maana's AI algorithms employs "user-guided, machine-assisted" paradigm, using artificial intelligence, in the form of Knowledge Assistants. These Knowledge Assistants enable users, under their human guidance, to build, connect, and find similarities from the various sources of knowledge. Maana's AI algorithms accelerate answering complex questions by analyzing hundreds of millions of data in minutes, something no human can possibly do. It then provides suggestions, like identifying patients with similar symptoms or finding fraudulent behaviors in the massive Bitcoin virtual currency network.

Companies can use the Maana Knowledge Platform 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.

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Figure 9: The Maana Knowledge Platform provides a comprehensive, knowledge platform.

Maana enables enterprises to translate insights into recommendations and embed them into the line-of-business applications for thousands of employees to make smarter day-to-day decisions. The result of this operationalization forms a feedback loop providing executives an understanding of the impact that Maana has on the business and its key performance indicators (KPIs).

Learn More

To learn more about Maana, please visit: **http://www.maana.io/use-cases/oil-gas/** or **contact us** at **sales@maana.io** to request a live demo.

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