Semantic Technology for Oil & Gas Businesses

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Abstract. Global events can trigger new challenges and changes in strategy in the blink of an eye. Knowledge intensive industries require early and accurate notification of global market changes as well as solid information collection strategies which are vital to good decision making.

For these purposes, the adoption of semantic technology will make companies aware of changes (ongoing and prospective) ahead of time: a key factor in staying competitive and up to date.

The Cogito Semantic Intelligence Platform uses semantic technology to reach unprecedented levels of depth and quality in intelligence analysis. The software drastically reduces the amount of manual analyst labor while providing immediate and complete information to aid multi-national Oil & Gas Companies in the decision-making process.

Keywords: Semantics, semantic technology, Oil & Gas, search, discovery, extraction, classification, analytics, unstructured information, knowledge management, competitive intelligence, decision making process

1 The scenario and its challenges

International Oil & Gas companies are committed to finding, producing, transporting, transforming and marketing oil and gas.

Within these companies, there are corporate functions devoted to Integrated Initiatives Promotion, where "integration" implies the achievement of core business results across several stages of the hydrocarbon value chain (upstream and downstream).

Creating value in today's globalized business encompasses a tight and continuous effort in understanding and anticipating what's to come environmentally, economically, politically or otherwise. As such, technological innovation is crucial to stay afloat in the energy and fuel market.

The risk for any international player is having an intelligence process that is slower than the speed of destructive marketplace events or having an "*after the fact*" approach in the process of tackling risks and opportunities in business and technology environment, with little or no room for maneuvering.

2 The solution

The adoption of semantic technology has enabled knowledge workers to select and connect pieces of knowledge critical to maintaining stability in a tumultuous industry. Field experience shows that knowledge is more about the connections among concepts within a text rather than just a mere collection of keywords or documents. A semantic engine is the only tool that can improve productivity and effectiveness in making such connections.

Cogito™ semantic software is that engine. Oil & Gas knowledge workers can employ such a semantic search engine to

- Capture the weak signals and nuanced technological advancements buried in textual documents;
- Distill key information, for example using SAO (Subject, Action, Object) structure identification, to boost technical problem solving so informed decisions can be made;
- Select, store and track the signals of knowledge from the huge overflow of current information until they become large enough to be classified as an opportunity or threat.

2.1 Key benefits

The benefits of adopting advanced semantic search tools range from the effectiveness of searching – providing targeted responses and extracting "meaning" from text documents – to the more complete organization of the company's information assets. It also ensures security and compliance, fosters knowledge sharing and cooperation among all users, and gives tangible support for business processes that are developed in the pursuit of the strategic mission.

- Reduced time and costs for information management using data mining, semantic search, content navigation and automatic categorization
- Monitoring of markets and competitors for competitive advantage
- Advanced collaboration platform for knowledge workers and analysts to share intellectual capital

The Cogito engine allows operators to manage information by capturing the weak signals in content, storing and tracking knowledge in an R&D environment, and distilling key analytical data.

3 Case studies

Scientific breakthrough: A government spokesman announces in the early morning that a scientist from Addis Ababa, Ethiopia, was able to produce hydrogen using bacteria. With the markets in London set to open in three hours, African press agencies start to push out news of the discovery.

Meanwhile, a knowledge worker at the headquarters of the Oil & Gas Group is just turning on his PC and opening the Cogito application from Expert System.

On the map, the knowledge worker notices a red light indicating a breakthrough in the African region. The worker begins analyzing information related to the discovery and is quickly able to notify his superiors of the implications for the Company — which are monumental — since they are looking for new and innovative ways to produce hydrogen.

Political and geographical awareness: Regional Authorities in the Gansu region of China are discussing the possibility of a new National Park area which would cover a significant part of the region. This information is still largely unknown to main press agencies, as it is still a just a simple proposal.

A Company has plans for an important gas plant in the area, and thus, is seeking political collaboration from local authorities. The information mentioned above could drive the Company strategy away from the area, or at least change the mid-term strategy. Knowing this type of information ahead of time could give the Company a lead on its competitors in the race for worldwide business.

Knowledge on territory: A Group spans almost a hundred countries, with tens of thousands employees. The amount of available documentation is huge, and sorting millions of documents for relevant information is a complex matter.

The Cogito platform performs semantic categorization and content identification, so that large unstructured document bases can be managed in a structured way, and thus extracts relevant documents in just seconds. For example, an operator using Cogito can effectively distill the large document base and extract only the documents 'relevant to the Gansu region which discuss Hydraulic Fracturing strategies which include the collaboration of sub-contractor EOG Resources', without even knowing the exact keywords and terms used in the various sources contained in the document base.

Corporate Knowledge Management: A Group manages several million technical documents containing deep technical content related to the Oil & Gas domain. The geographical aspects of documents (locations of plants, basins, oil fields, all proprietary and generic locations) are of extreme importance. The entire database of documents is easily processed by the Cogito platform, which contains a rich customized semantic network of millions of geographical entities and their locations, including their relationships to other locations and resources.

The processed documents are then enhanced by Cogito with a geographic bounding box (a coordinate rectangle containing the relevant locations and resources in the document). These bounding boxes can be used to instantly identify all the documents relevant to any area worldwide, and selection can be further filtered by topic, category, contained entities, etc. In this way, the Group can immediately have all and only those documents strictly related to any geographical location in the world, ranked by distance, relevance to topic, etc.

Social and political awareness: Websites providing breaking news announce uprisings in the Gombe State of Nigeria. The Company has a major oil plant in this region so Analysts are keeping this area (and others) monitored with the Cogito platform.

News of the uprisings is "pushed" to the operators without user action, thus notifying the Company as soon as news is available. This gives the Company the opportunity to immediately deploy evacuation or other security-related procedures for the staff and families working in the plant, before the staff itself is even aware of the uprising.

3.1 The facts

While some particulars of these stories are fictional, the overall narratives are not. Global Oil & Gas Companies face situations similar to these on a daily basis. These companies are present in many countries, and world events can trigger new expenditures and changes in strategic direction. To address these unique challenges and benefit from early and accurate notification, the solution is an investment in an innovative business intelligence platform.

Companies have turned to Expert System's Cogito platform for an especially precise tool to help them improve the information flow from external sources, enhance data management and make the best use of the intellectual capital within the company.

4 The future

Semantic technology has played, and will continue to play, a critical role in supporting strategic decision processes, handling data in internal knowledge generation and management, and monitoring and detecting early signals of change in the energy markets.

For the future, Expert System customers can expect that this collaborative investment in semantic intelligence will contribute to the enhancement of the knowledge management process in other parts of the company worldwide and solve the problems of

- Wasting efforts on poor content, through an early selection of high quality information without "fully reading" the text.
- Not finding/receiving information that could be potentially detrimental to the business.
- The unnecessary re-creation of content, because managing knowledge with semantics overcomes the "*If we only knew what we know*" syndrome.