Artificial Intelligence in Supply Chain Management in Oil and Gas

Introduction to artificial intelligence and its role in the supply chain of oil & gas operations

AI is referred to as the use of computers for reasoning, recognizing patterns, learning, or understanding certain behaviors from experience, acquiring and retaining knowledge, and developing various forms of inference to solve problems in decision-making situations where optimal or exact solutions are either too expensive or difficult to produce.

AI creates a simulated experience that plays a vital role in the decision-making process. The use of machine learning techniques and case-based reasoning to reference previous knowledge of similar situations could save time, money, and workforce across the first stage of the E&P process. Machine learning and other big data applications could save the oil and gas industry as much as $50 billion\textsuperscript{1} in the coming decade.

The oil and gas industry is one such place where millions of operations generate a huge quantum of data, which is impossible to be scrutinized, analyzed, and draw some trends from it. The supply chain for the oil and gas industry is a complex operation where there are several key decision nodes like crude purchase, price of the purchase, transportation to the refinery, refining operations, gantry operations, and retail sale of end products. As crude moves ahead in a stepwise manner, so does the complexity of decisions increases.
There are several avenues that oil and gas companies are exploring in terms of the application of artificial intelligence in the supply chain of oil and gas operations. These areas are:

- **Prediction of the market price of crude oil and finished products**: This helps in taking decision for pricing contracts.
- **Optimization of the crude basket, warehouse, and logistics, inventories, shipping operations**: This helps in making sure that the optimal kind of crude oil is selected and it is being delivered and handled appropriately.
- **Risk hedging**: Appropriate investments to offset the risks due to change in supply, demand, and prices.
- **Vessel tracking**: Tracking the deliveries to handle warehouses and demand from end customers.
- **Planning and scheduling**: Planning and scheduling allows the company to better utilize their assets, time and inventories to fulfill the orders with a minimal time lag.
- **Deploying Robotic Process Automation**: Operations which are repetitive and high on consuming human to be replaced by robots leading to drastic impact in terms of productivity, efficiency, and accuracy on the business processes industry.

Oil and gas sector has huge potential for implementing AI in its supply chain operations:

- **Predictive capabilities are helping demand forecasting**: When inventory lags demand, companies suffer losses. AI is ramping up efficiencies in network planning and predictive demand, allowing merchandisers to become more proactive. By knowing what to expect, they can adjust the number of vehicles and direct them to locations where maximum demand is expected. This leads to lower operational costs.
- **Chatbots are redefining customer support**: 80 percent of all customer engagements can be handled by bots. AI can personalize the relationship between customers and logistics providers.
- **Smart warehouses are more efficient**: A smart warehouse is a fully automated facility wherein most work is done through automation or software. Deliveries can be scheduled through logics without missing any deadlines.
- **Algorithms are improving delivery times and reducing costs**: In
the logistics business, every mile and minute matters. Companies can use a route planner based on genetic algorithms to map out optimal routes for deliveries.

EXHIBIT 1: Different supply chain components in oil and gas value chain where AI creates a difference

AI supports distinct functions across the oil and gas value chain, each of which has an element of the supply chain involved.

- **Upstream**: In the upstream business, the supply chain is important from equipment and material transportation aspects. Slight delay or unavailability of spares/ key components can lead to huge operational losses. AI can coordinate the operations team with the warehouse making sure the availability of crucial parts.

- **Midstream**: In midstream business, it is more from storage and transportation of oil and gas through multiple mediums like ships, trucks, or rail. AI assists here in proper planning and execution, optimal route selection, etc.

- **Downstream**: In downstream business, AI helps refiners to plan optimal blending, forecasting the demand, estimating prices, and improvising customer relationships.

**Participation of major oil and gas players?**

**BP**: It launched its proprietary Compass platform, which forms the backbone of procurement transformation within and beyond its Global Business Services (GBS) division.

**Benefits achieved:**

- The platform is developed with scalability and flexibility in mind and enables integrated, end-to-end, digitalized procurement processes.
- It offers ease of use, visibility, artificial intelligence, automated source-to-pay (S2P) functions, and a portal for external
stakeholders.

- A key feature of the mechanics of supplier interactions solves the optimization challenge.

**Shell:** It partnered with [databricks](https://www.databricks.com) for a cloud-native unified analytics platform that helps with improved inventory and supply chain management.

**Benefits achieved:**

- Scalable predictive model deployed for **more than 3,000 types of materials at 50+ locations**
- Inventory analysis and prediction time **reduced to 45 minutes from 48 hours** - a 32X performance gain
- Cost savings **equivalent to millions of dollars** per year

**Chevron:** It partnered with [Microsoft](https://www.microsoft.com) for its Azure platform, which allows Chevron’s IT workforce to evolve from supporting infrastructure to one that enables more advanced technologies, as well as optimize exploration, reservoir management, production operations, midstream logistics, and marketing operations.

**ExxonMobil:** [CAPS Research](https://capsresearch.com) and ExxonMobil co-hosted an event for professionals interested in exploring strategies and experiences in the area of robotic process automation that utilizes artificial intelligence/computer software to assist in various processes, communication, data interpretation, is a seemingly ideal tool for the transactional aspects of the procure-to-pay process.

**Benefits achieved:**

- From PO creation to order approval and invoice verification, RPA can help eliminate human error and allow supply management employees to focus on important strategic issues.

**Total:** It signed a partnership agreement to create a digital innovation center in India with [Tata Consultancy Services](https://www.tcs.com). The partnership initially focused on refining (production units, processes, supply chain, and petroleum product markets) will be driven in a wide-ranging way to improve refinery performance. Real-time data analytics, the Internet of Things, automation, artificial intelligence, and agile methodology will be used to improve industrial efficiency, energy performance, and availability rates.

**Way forward on leveraging AI**

- The prominent players of the oil and gas industry are making bold
strides with AI by integrating it in multiple areas, such as reducing carbon footprint, deep-sea exploration of hydrocarbons, and implementing innovative and sustainable energy strategies to drive the evolution pace

- According to a research and consulting agency, the AI in Oil and Gas market was valued at USD2 billion in 2019 and is expected to reach USD3.81 billion by 2025, at a CAGR of 10.96% over the forecast period 2020-2025
- A decrease in the cost of sensors, the steady ramp-up in data processing capabilities, data storage capacity in the cloud and increased investment in research will catalyze the adoption of artificial intelligence in the oil and gas industry
- Adoption of AI-powered drones developed by players like **ABOVE** is used to inspect railroads, power lines, or oil pipelines for quality-control and upkeep purposes. Operators can also plan exact routes for Above’s UAVs. The drone will then travel the route, film what it sees, and create an actionable report based on its findings.

References

1. EnergyWorldMag