Unlocking Value with Blockchain in Oil & Gas

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Summary
Blockchain enables independent entities with shared pain points and related interests to form a consortium. The typical objective is to improve operational performance by sharing trusted data with rapid visibility.

Starting in 2014, the oil & gas industry experienced volatile and challenging times with lower oil prices. This led owner-operators and service companies to increase automation, adopt new technologies, and integrate their IT/OT environments. Blockchain can help by ensuring the integrity, traceability, and providence of the data exchanged among independent entities.

Tata Consultancy Services (TCS) recently briefed ARC Advisory Group on its experience and capabilities with blockchain and how it can be leveraged to enable oil & gas firms to realize operational improvements.

What Is Blockchain?
Blockchain has recently gained notoriety as the software infrastructure enabling cryptocurrencies. It has proven successful as a means to manage ownership among independent entities without a central authority using a distributed, peer-to-peer network. Industrial applications have begun to emerge for self-governing business processes that extend across a consortium of stakeholders.
Blockchain is a secure distributed ledger providing visibility, an audit trail, and faster transactions at reduced cost. Blockchain enforces trust in complex processes such as those often encountered in oil & gas transactions, helps automate existing business processes, removes middlemen, prevents fraud, and provides transparency. Blockchain uses a combination of encryption, distributed database, and enforcement logic for data integrity and secure transactions. Trust is decentralized and rests with the blockchain protocol without a central authority or broker such as a government or bank.

**Blockchain Key Capabilities**
Blockchain provides several key features that make it a valuable technology for oil & gas companies. These include:

- Near-real-time recording of transactions and visibility among participants, removing friction, and reducing risks
- Multiple layers of cryptography, a distributed database, and logic provide data security and self-governance for peer-to-peer (P2P) transactions
- Data integrity avoids double spending, fraud, and manipulation
- A blockchain transaction can initiate predefined business steps to execute commercially legal transactions to create smart contracts

**Blockchain Pilot Programs in Oil & Gas**
In the second half of 2018, a few pilot programs utilizing blockchain began in the oil & gas industry. Common themes in these pilot programs include:

- Collaboration among independent entities with shared pain points and related interests motivate them to form a consortium
- Improved operational performance by sharing trusted data with rapid visibility
- Have leaders, but all invest and all consortium members benefit

ARC has reviewed several ongoing pilot programs in the oil & gas industry. We summarize these below.

**VAKT Consortium for Trading Crude Oil**
The VAKT Consortium is piloting a trading platform for crude oil contracts. It replaces a manual paper-based system using FAX, email, or postal with
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Blockchain is expected to play a key role in energy trading, supply chain optimization, smart contract management, chain of custody and data integrity, and regulatory compliance. The documents include letters of credit, invoices, and inspection certificates. The pilot started in November 2018 and wider release is planned in the beginning of 2019. Participants include:

- Oil companies: BP, Equinor, and Royal Dutch Shell
- Traders: Gunvor, Mercuria, and Koch Supply and Trading
- Banks: ABN Amro ING, and Societe Generale

**ADNOC Blockchain Platform for Oil & Gas Production**

ADNOC is piloting a secure, blockchain-enabled platform for tracking, validating, and executing crude oil transactions from production well to customer. The pilot is focused on the ADNOC operating companies to automate accounting processes, reduce execution time, and improve reliability. It includes 14 specialist subsidiary and joint venture companies for oil and gas exploration and production. The program was announced in December 2018.

**Diamond Offshore Blockchain Drilling Service**

Diamond offers software to manage well construction. The application of blockchain focuses on coordinating well construction activities among operators and subcontractors. Diamond Offshore launched the inclusion of blockchain in June 2018.

**Blockchain Features and Benefits for Oil & Gas**

Blockchain interest has grown because of successful pilots and proof of concept. Blockchain benefits include:

- Secure distributed ledger containing documents and transactions
- End-to-end genealogy with the block data structure
- Payment and invoice settlement
- Equipment tracking with real-time location for maintenance

Blockchain technology can help oil & gas companies improve their operations in several different areas. These include:

- Equipment tracking through its entire lifecycle – from assembly to operations in the field for inventory management and asset utilization
- Maintain component level genealogy to track provenance of materials and equipment i.e.,
check authenticity in real-time to reduce fraud or counterfeit parts that cause safety issues or unplanned downtime

- Enable smart contracts that automate business processes involving acquisition of equipment, chain of custody for products, and supply chain access controls
- Transform manual paper and email record-keeping to digital with enhanced visibility, auditability, and immutability. Paper-based records are stored and difficult to access during duration of contract making tracking of change orders and production or revenue sharing contracts difficult

**TCS Capabilities**

As a well-known global service provider, Tata Consultancy Services (TCS) provides technology services, consulting, and business solutions. The company is part of the Tata Group, one of India’s largest industrial conglomerates. TCS was established in 1968 as a division and became incorporated as a separate entity in 1995.

TCS offers a broad portfolio of solutions, services, and requisite domain expertise in nine leading blockchain platforms. This experience can help oil & gas companies deploy blockchain and achieve business value. Blockchain adoption requires a range of technical skills and application knowledge. Involving TCS should accelerate time to benefit with reduced risk. Areas in which TCS typically engages include:

- Articulate blockchain strategy and roadmap
- Validate and develop relevant use case details
- Accelerators for blockchain architecture framework and checklists
- Conduct PoCs and pilots on a simple, ready-to-use platform
- Leverage partnerships and hands-on experience with market platforms
- Implement projects with enterprise integration

**Recommendations**

Operators, independent exploration & production (E&P) firms, and relevant industry stakeholders should increase their level of awareness and understanding of blockchain. As shown in the ongoing pilots, blockchain is being applied to oil trading, well construction, and crude oil extraction in E&P.
Blockchain enables independent entities with shared pain points and related interests to form a consortium. The objective is to improve operational performance by sharing trusted data with rapid visibility.

The oil & gas industry is operating in challenging times with compressed margins; reduced resources and funding; and an ever-pressing need to find, extract, produce, and refine hydrocarbons more cost effectively.

To deploy and leverage digital technologies such as blockchain most effectively, operating companies should consider entering into technology partnerships with companies such as TCS that have both the sophisticated technical systems and deep oil & gas domain expertise that are critical to achieve operational excellence.

Appropriate technology partnerships can also help ensure cost-effective implementation, deployment, and long-term success.

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