

# Blockchain Adoption in Oil & Gas: A Framework to Assess Your Company's Readiness

## Abstract

The Oil and Gas (O&G) industry has traditionally been a slow adopter of new technologies, preferring to wait and watch, rather than disrupt and lead. Whether it is robotics or Big Data analytics, the industry's technology inertia can be attributed to an inherent resistance to change and the apprehensions arising out of fear of failed investments. Deterred by large capital outlays, most O&G companies have maintained status quo for extended periods of time and embraced only major disruptions, instead of making incremental changes. However, in recent times, the industry is realizing the disadvantages of doing so; prompting executives to focus on accelerating responsiveness and ensuring immediate gratification of consumer demands, while effectively tracking their resource base. As Industry 4.0 gains momentum in the O&G industry, blockchain is one of the technologies poised to drive wide-spread digital transformation.

The paper identifies various points of intervention across the O&G value chain, where blockchain adoption can help industry players realize tangible benefits. It also presents a strategic approach using a structured framework to help O&G organizations embrace and lead the blockchain disruption with minimal investment and effort.

## The Complicated Oil and Gas Value Chain: A Closer Look

The traditional O&G sector comprises three markets: the upstream sector that focuses on exploration and extraction; the midstream sector involved in storing and marketing along with transportation of the intermediate products and by-products; and the downstream sector that refines and processes the products followed by distribution and selling for final consumption by end users. Companies might operate in any of one of the markets or a combination of markets.

Given the extensive and complex nature of the O&G value chains, information security issues and risks can arise at several intervention points across the chain, resulting in losses for the company.

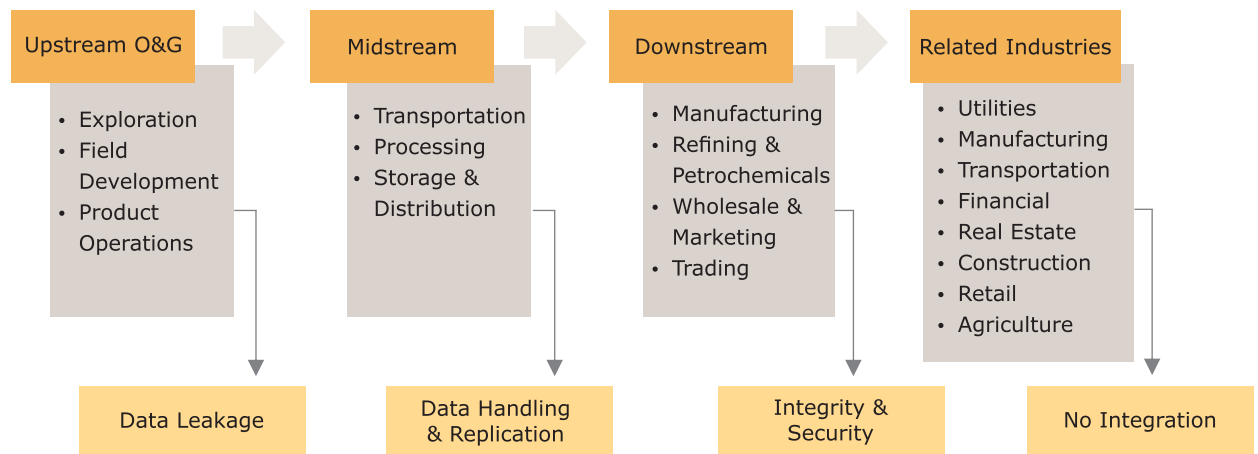


Figure 1: Indicative issues across intervention points in a typical O&G value chain

Table 1 lists down the major issues, their causes, and manifestation across the diverse points in an O&G value chain.

Major Issues	Cause	Manifestation
Data Leakage	Data that is not stored and processed effectively may result in loss of raw data and valuable information. Data generated at different locations may not be correlated and/or treated.	<ul style="list-style-type: none"> <li>Data is not being used effectively in conjunction with Big Data Analytics and AI to generate meaningful insights.</li> <li>Partial data or wrongly tagged data may result in wrong decision making.</li> </ul>
Data Handling and Replication	Duplication of third party transactions and effort may be caused by the replication of contracts by different parties.	<ul style="list-style-type: none"> <li>Increased operational expenses</li> <li>Higher interaction costs</li> <li>Non-verifiable transactions, prone to errors</li> <li>Delayed transactions, leading to significant losses</li> </ul>
Integrity and Security	Tightly knit networks make the whole value chain vulnerable to external and internal attacks.	<ul style="list-style-type: none"> <li>Fraud</li> <li>Cyberattacks/phishing</li> <li>Virus/malware attacks</li> <li>Loss of trust</li> <li>Increased cost of authentication</li> </ul>
Lack of integration	Lack of standard procedures lead to integration issues across platforms and players.	<ul style="list-style-type: none"> <li>Loss of resources in the form of time and money.</li> </ul>

Table 1: Major information security issues across the O&G value chain and their Impact

## Deploying Blockchain at Points of Intervention: How it Works

According to a recent Deloitte report, 45% of O&G executives acknowledged blockchain's disruptive potential for their industry, while 55% agreed that it will become a critical imperative to retain competitive advantage in the future.<sup>i</sup> Acting as a shared database, blockchain helps eliminate third party intervention in transaction processing, thereby facilitating multiple ways of information sharing. Encrypted connections and integrated shared databases act as a safe platform for exchanging contracts, inventories, payments, and other data that needs to be shared with multiple stakeholders across the value chain. Table 2 showcases the benefits of using blockchain at various points to address the information security issues highlighted in Table 1

Major Issues	Benefits of Using Blockchain
Data Leakage	<ul style="list-style-type: none"> <li>Prevents data leakage with respect to provenance and sourcing.</li> <li>Hologram technology or Radio Frequency Identification (RFID) tracking enables linkage of varied forms of digital data.</li> <li>Controls quality to prevent further loss.</li> </ul>
Data Handling and Replication	<ul style="list-style-type: none"> <li>Provides greater clarity and transparency across different participants through joint operations and agreements.</li> <li>Helps eliminate the costs and time involved in third party reconciliations.</li> </ul>
Integrity and Security	<ul style="list-style-type: none"> <li>Enables efficient critical asset management or performance lifecycle management.</li> </ul>
Lack of integration	<ul style="list-style-type: none"> <li>Facilitates open energy trading by enabling integration of various stakeholders.</li> <li>Improves transaction quality, reliability, and speed.</li> </ul>

Table 2 : Efficacy of block chain in tackling major issues across the O&G value chain

## Instances of Blockchain benefits in E&R

The E&R industry can reap the following benefits by deploying blockchain.

1. By preventing data leakage and enabling tracking and monitoring, blockchain can help prevent information mis-management across the value chain. Companies will be able to tap into hidden opportunities, generating new revenues streams and contributing to the bottom line.

**Case in point:** BHP Billiton<sup>ii</sup> and Petroteq<sup>iii</sup> use blockchain to enhance operational efficiency through improved tracking, monitoring, and control of their diverse resources.

2. Blockchain can help override the risks of maintenance failure, enabling effective control and upkeep of assets.

**Case in point:** BP is working with Italian O&G major Eni and Wien Energie from Austria to utilize blockchain to consolidate back-office processes, cut down risk, protect against cyber threats, and save costs in the long run.<sup>iv</sup>

3. Blockchain helps open up avenues for integrated activities underpinned by increased quality & efficiency, prompting value chain players to break operational silos, and leverage the ecosystem for incremental gains.

**Case in point:** BP, Shell, Statoil, and other leading companies are forming the blockchain consortium – a centralized digital platform for energy commodities trading.

## Driving Superior ROI: Using a Structured Framework for Blockchain Adoption

O&G companies will need to evaluate several options to determine the applicability and feasibility of blockchain solutions with respect to their current mode of operations, incumbent assets, and technologies to ensure superior ROI. The adoption framework shown in Table 3 can be used to determine the adoption readiness of O&G companies. In this framework, percentages are assigned to different parameters using the Analytical Hierarchical Process (AHP), which is a well-known technique that helps in taking complex decisions, based on mathematical formulae and psychology.

Aspect	Considerations	Rank (Scale of 1-5)	Self-Score	Final Percentage
Identifying areas that need immediate attention & mapping their contribution to the revenue	<ul style="list-style-type: none"> <li>Enabling cost savings across operations</li> <li>Driving revenue generation from pay-per consumption model, licensing costs, and micro-payments</li> <li>Using blockchain to enable extraction of deeper insights from other allied technologies such as AI, Big Data Analytics, and cloud computing</li> <li>Improving transparency and clarity across the value chain for the participants</li> </ul>	1	A	41.6% * A
Conducting Feasibility, Suitability & Acceptability (FSA) Analysis	<ul style="list-style-type: none"> <li>Pilot projects</li> <li>ROI analysis (investment required)</li> <li>Future cash flow</li> <li>Stakeholders likely to be impacted and IT system &amp; team maturity</li> </ul>	2	B	26.2% * B
Considering external & internal factors	<ul style="list-style-type: none"> <li>Government regulations &amp; support</li> <li>Internal strengths &amp; weaknesses</li> <li>O&amp;G industry players &amp; competition</li> <li>O&amp;G industry index &amp; prices</li> </ul>	3	C	16.1% * C
Positioning business	<ul style="list-style-type: none"> <li>Determining current operational focus in the O&amp;G value chain</li> <li>Determining the cultural fit</li> </ul>	4	D	9.9% * D
Assessing stakeholder outlook	Impact on: <ul style="list-style-type: none"> <li>end user experience</li> <li>shareholders</li> <li>Employees</li> <li>community</li> </ul>	5	E	6.2% * E
Total Score**** (The sum total of all the stepwise scores) - Out of 100%		Summation %		

Table 3: Blockchain Adoption Framework by O&G Companies

Here's how it works:

**Step # 1 – Assign ranks:** After the different parameters have been identified with the help of the structured literature review (Exploratory qualitative research), the parameters are prioritized and assigned ranks on a chosen scale as shown in the table above. The ranks may also vary as per the requirements and demand from the Oil & Gas companies.

**Step # 2 – Calculate percentages:** Percentages are calculated through qualitative comparative analysis of the parameters. Oil & Gas companies only need to identify the comparative scores of the parameters, and the standard percentages will be generated through AHP.

In the above case, rank 1 means the highest (5 on a scale of 1 to 5), rank 2 means a value of 4, rank 3 means a value of 3 and so on. The standard percentages, as calculated by AHP, are shown in the Percentage column.

**Step # 3 –Assign a self-score:** This score for each parameter is awarded by the company after evaluating its blockchain adoption readiness. The scores range on a scale of A to E, where A to E could vary from 20% to 100%.

**Step # 4 – Compute final percentage:** For each aspect, a final percentage score is calculated by multiplying the percentage score with the company's self-score (resulting in a percentage).

For example, if a parameter has a percentage score of 40% and the Oil & Gas company assigns a score of D (80%) to it, then the final percentage score of that parameter in the last column will be 80% of 40% which is 32%.

**Step # 5 – Arrive at the total score:** The total score is calculated by adding up the final percentages across all aspects. This represents the overall readiness of the O&G Company to embrace blockchain as a technology enabler. The higher the score, the better prepared a company is to deploy blockchain and reap its benefits.

## Blockchain Beckons, But Look before You Leap

Given its multi-pronged benefits, blockchain is touted to become the technology that will fuel the next boom in the O&G industry, which is in need of a large-scale makeover. As transparency, scalability, efficiency, and security become imperative to success for new-age O&G businesses, blockchain can act as the harbinger of quality, efficiency, and agility. Blockchain-enabled smart contracts, certifications, and compliance are already driving automation of O&G processes, in turn, improving transparency, operational efficiencies, and reducing costs. In the future, intelligent and agile blockchain-enabled O&G networks will morph into AI-enabled cognitive networks, helping companies drive even greater value from their assets.

However, O&G companies looking to jump on the blockchain bandwagon must exercise caution. Performing an in-depth feasibility analysis leveraging a structured framework - such as the one discussed in the paper - can help accurately determine their alignment and readiness to adopt the game changing technology, significantly boosting their chances of success.

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### About The Authors

Swayambhu Dutta, Research Analyst, Marketing Transformation – Research team, TCS

Swayambhu Dutta is a research analyst in the Energy & Resources (E&R) industry unit looking after the North America, ANZ, & MEA geographies. He has around seven years of experience spanning across E&R and Telecom vertical. Currently, he is working as a Business Analyst enabling strategic decisions and bid support for the company. Swayambhu is a Gold medalist during his MBA stint in XIM, Bhubaneswar. He is a telecom engineer with deep interest towards Oil & Gas value chain technologies.

Soumya Banerjee, Research Lead of Marketing Transformation – Research team, TCS

Soumya Banerjee is presently the Research Lead of Marketing Transformation – Research team in TCS. Soumya is leading research for Energy & Resources and Healthcare verticals and advising research activities for Retail, CPG (Consumer Packaged Goods), and TTH (Travel, Transport and Hospitality) verticals. He is also leading research for geographies including APAC & ANZ, Japan, LATAM, and MEA. He has over 12 years of cross-industry experience. Soumya has completed his MBA from UK. He also holds an MS degree in computer Science and a B.Tech in Computer Science & Engineering.

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