EXECUTIVE SUMMARY

The Digital Transformation of Oil and Gas

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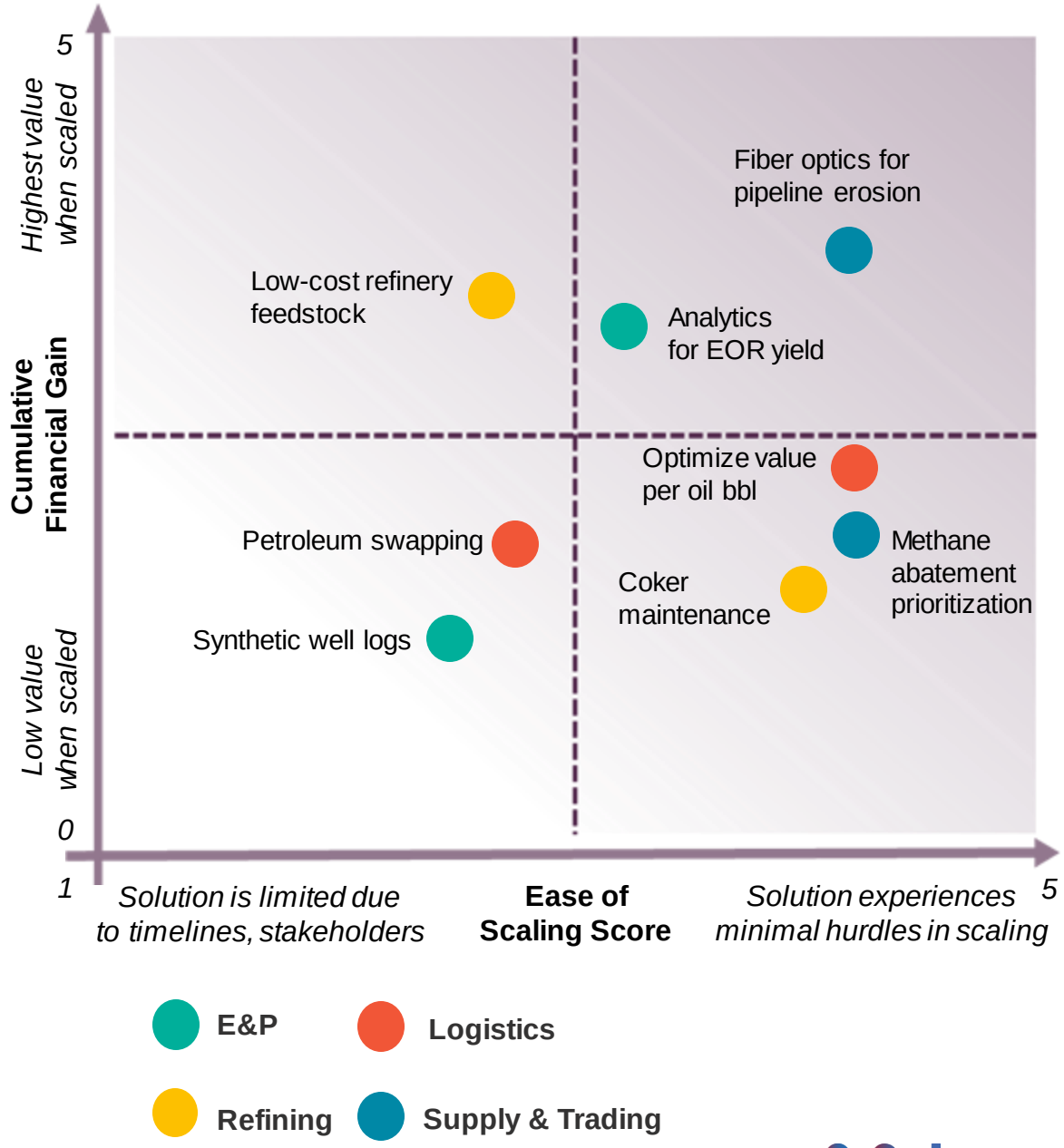
Executive Summary

The oil and gas industry today faces four key challenges: volatile commodities, workforce retirements, low carbon economy, and shifting geopolitics. Culminating in its new era of operational efficiency, digital transformation serves as the answer for cost reduction and revenue increment.

As the industry struggles to successfully scale up digital across global operations, we provide a framework for identifying applications that hold potential for enterprise-wide deployment to avoid scale-up failures. From our analysis, we conclude that while the majority of applications do offer ease of scale-up, not all of them produce high financial gains. A handful of applications instead contribute to other value drivers, such as sustainability.

Moving forward, as the digital transformation of the industry matures, we anticipate more operator-operator digital collaborations, creation of data marketplaces, inception of "tech" oil companies, and disruption of traditional service companies by major software giants.



The modern oil and gas industry today faces a four-pronged challenge that is pushing reinvention of the sector

The oil and gas industry today faces a string of challenges that have led to drop in collective market cap for oil companies in the past decade. On a broader level, these issues can be categorized in the four main pillars below. These challenges are externally driven by factors outside of the industry's control. As a result, the industry has to be highly proactive in order to ride these challenges.

Volatile commodity prices

The oil and gas industry regularly undergoes downturns that impact its financial returns, most notably the 2014 oil price crash.

Workforce: Safety and retirement

Worker safety remains a responsibility of the industry that leads to significant costs. Furthermore, a majority of the skilled labor is retiring, leading to knowledge losses.

Low-carbon economy

As governments throughout the world promote electrification of road transport, oil companies have come under pressure to sustain growth and reduce their own emissions.

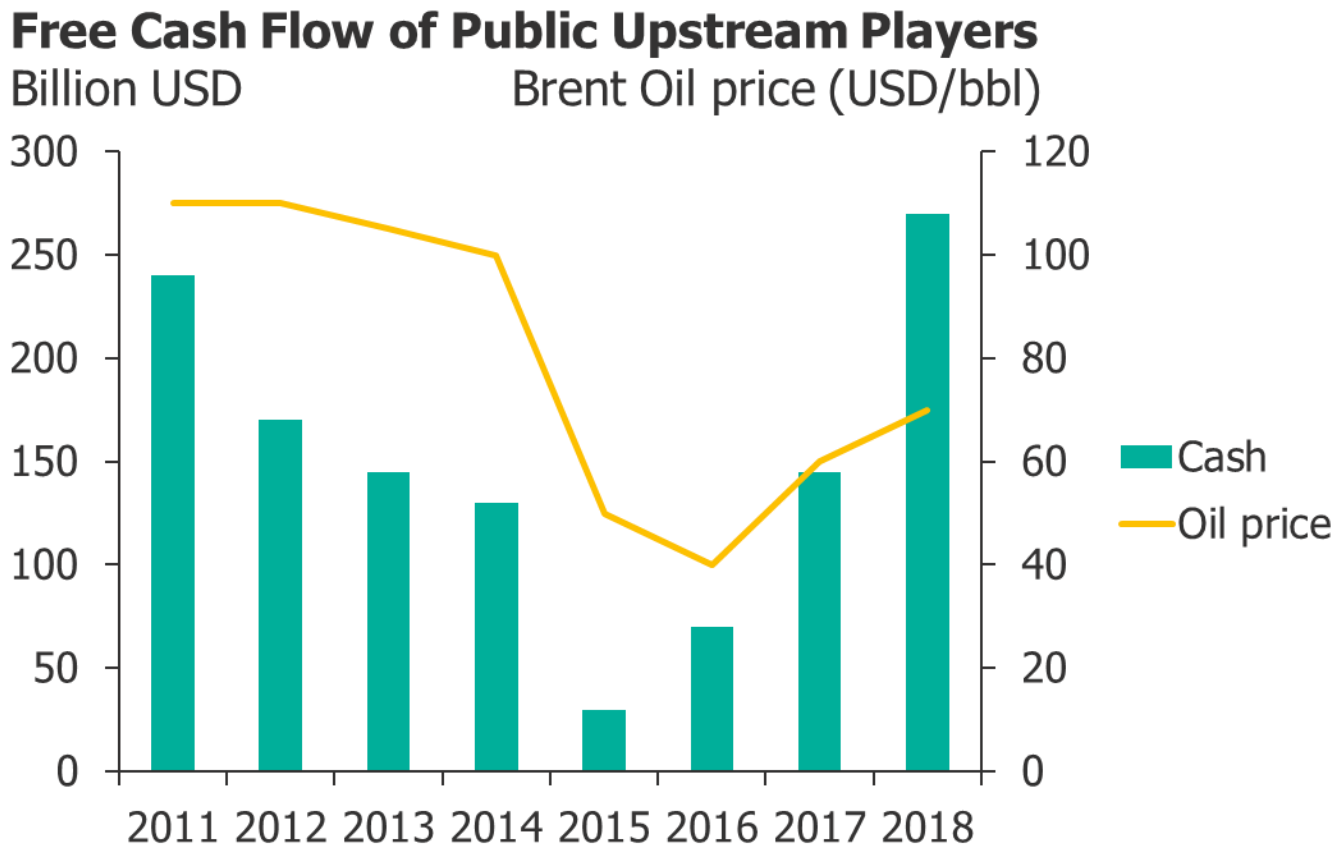
Supply chain, politics

With a major chunk of oil and gas demand now stemming from Asian countries like India and China, the supply chains and geopolitics around oil are gradually pivoting to the East.

However, the most fundamental imminent issue that oil and gas players face is from the very nature of the industry

The biggest growth hurdle oil companies face today is from the volatile nature of oil. Five years after the 2014 oil price crash, when WTI hit $28/bbl, the industry is still repositioning itself. The oil business can no longer enhance its profitability by earning higher revenues due to strong oil prices. Instead, the industry has to grow margins at a $50/bbl to $60/bbl oil price via reducing operational and capital costs.

To its credit, the industry has done a commendable job, regrowing its free cash flow in 2018 to levels higher than 2011. However, this challenge is further complicated by the projected stalling and eventual decline in the demand for hydrocarbons in a low-carbon future (see the report "Bridging the Gap"). In summary, oil and gas players have to continue growing margins in an industry where demand will stall, while competition grows.



Source: Rystad Energy

In our analysis, we evaluate use cases from the six core outcomes of DT that drive competitive edge for oil and gas

Digital transformation adds value across every function of a business by enabling six core outcomes:

Uncover Invisible Insights	Find an insight by analyzing a signal or set of signals that humans can't easily interpret
Predict the Future	Determine the most likely outcome of a future situation – a particular type of invisible insight
Optimize	Find optimal setpoints given a set of constraints – a particular type of invisible insight
Upskill Humans	Grant humans a skill they didn't have before
Make Information Accessible	Make information visible and apparent
Automate	Eliminate or reduce human involvement in a process, task, or decision

These six outcomes represent the building blocks of the universe of goals for digital transformation projects; **any digital transformation technology or implementation will aim to achieve one or more of these outcomes, which build toward specific business impacts.**

Exploration and Production

USE CASES

- Process automation
- Optimized operations

APPLICATIONS

- Synthetic well logs
- Analytics to improve EOR yield

DIGITAL USE CASE

Process automation

WHAT IT IS

Automation of a set of physical or computational tasks that are simple and frequently repeated, and would otherwise be performed by a human.

WHAT IT ACHIEVES

Uncover Invisible Insights	Upskill Humans
Predict the Future	Make Information Accessible
Optimize	**Automate**

EXAMPLES ACROSS INDUSTRIES

AEROSPEC TECHNOLOGIES

Aerospec develops drone-based visual data analytics and an AI platform to automate inspection processes and streamline O&M efficiencies for solar assets.

VISION ROBOTICS Corporation

Vision Robotics develops and integrates computer vision solutions with hardware to build automated agricultural equipment (thinner, pruner, harvester).

ExxonMobil

ExxonMobil partners with six companies for open process automation (OPA) systems and selected Yokogawa for the initial test bed for operation by Q4 2019.

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APPLICATION

Synthetic well logs for drilling

INTRODUCTION

Logging while drilling (LWD) is a practice in upstream to obtain geological measurements of the well. This is done by lowering logging tools that can cost up to $500,000 in offshore.

APPLICATION

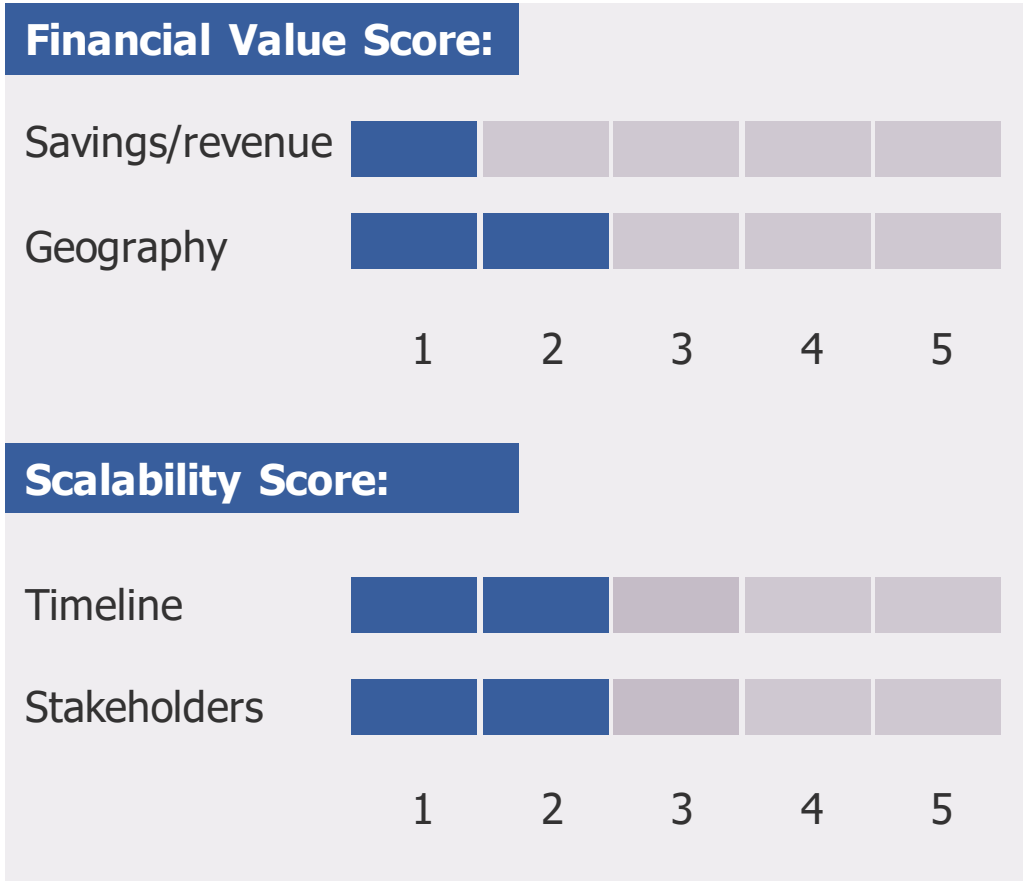
To reduce costs in the GOM, Shell trialed Quantico's services for synthetic well logs. Quantico develops well logs from dynamic drilling data. The software produces logs, such as shear or compressional, using drilling data like WOB or ROP. With Shell, Quantico created logs for existing wells in the Appomattox as part of the trial.

RESULT

The trial indicated that Quantico's sonic logs and density logs were within 95% accuracy. Via future deployments, Shell could potentially save more than 80% in logging costs by reducing labor and automating logging.

KEY PLAYERS FOR EXAMPLE BELOW

Quantico Energy, Shell



Summary: "Make information accessible" and "optimize" are the prevalent core outcomes enabled by digital for oil and gas

APPLICATIONS	CORE OUTCOMES ENABLED BY DIGITAL TRANSFORMATION						Cumulative Financial Value (1 to 5)	Ease of Scaling (1 to 5)
	Uncover Invisible Insights	Predict the Future	Optimize	Upskill Humans	Automate	Make Information Accessible		
E&P								
Synthetic well logs	■		■		■		1.3	2
Analytics for EOR yield			■				3.1	2.6
Refining								
Coker unit optimization	■	■					1.9	3.3
Low-cost refinery feed		■					3.4	2.3
Logistics								
Fiber optics for pipelines						■	3.6	3.3
Imaging for methane abatement prioritization						■	2.2	3.3
Supply and Trading								
Petroleum swapping						■	1.6	2.3
Optimizing value per barrel for oil blending			■				2.3	3.3

The future oil company is actually a tech company

While most of the digital leaders among O&G companies today are embroiled in the scale-up of digital across their businesses, this phase will eventually lead to a new era of O&G companies that are more "tech" companies than traditional oil companies. Such organizations will be on the frontier of innovations that enable performance in remote environments – such as hybrid cloud, 5G, and digital twins.

Furthermore, they will innovate in a similar fashion as tech companies do – that is, faster and more agile product rollouts, deployment, and feedback loops. Tech oil companies will also focus on the same challenges that a Silicon Valley-based tech company would worry about, such as cybersecurity and enterprise-wide data sharing.

> Aker BP is a **tech company** that just happens to produce oil.
>
> **Karl Hersvik**
> *Aker BP*
> CEO

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