Research Sample

Identifying Ways to Reduce Drilling Budgets in the Low Oil Price Environment

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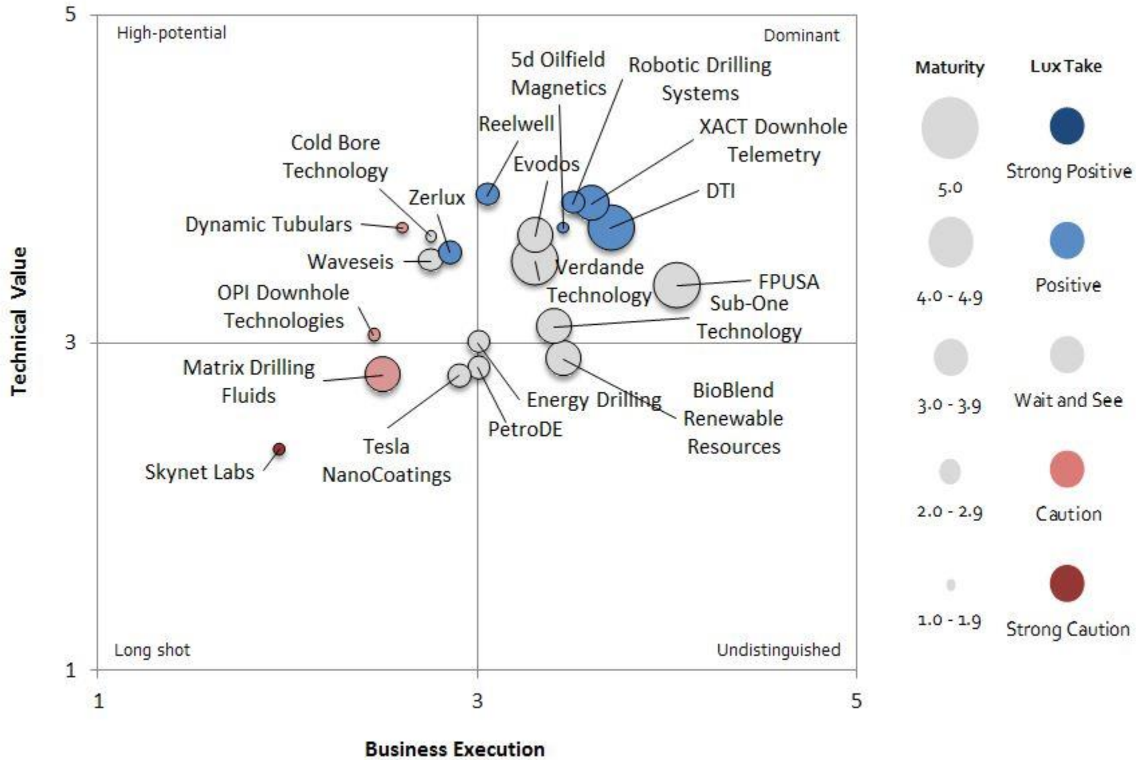
Executive Summary

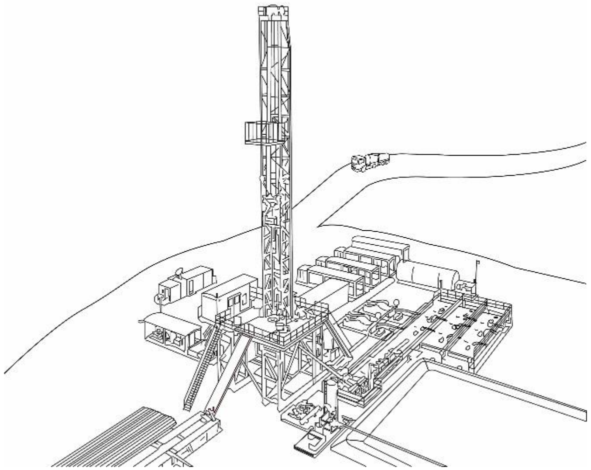


- Current oil prices remain low and the rig count remains half of what it was at the start of the year. These conditions are causing operators to restructure and streamline operations. Operators are likely to focus on improving drilling efficiency.
- **With many new technologies available, start-ups in the drilling industry that reduce non-productive time – whether replacing personnel, such as Robotic Drilling Systems, or preventing disaster like 5d Oilfield Magnetics – will be the most successful.** To understand the impact of these technologies, it is crucial to understand the process of completing a drilling project and identify major pain points.

Reducing contingencies is key

- Every drilling budget, regardless of target formation, includes the same main components: **the drilling rig, drill string, fluid system, casing, cement, and completions.** One of the largest costs associated with drilling wells is the cost of the rig, which can range from hundreds of thousands of dollars to millions, depending on the formation being targeted. With daily rates so high, any failures onsite that cause drilling delays can cost operators millions of dollars. Operators try to account for the cost of non-productive time (NPT) in well budgets as "contingencies." This cost usually represents 10%-15% of the budget for any given well, but can be up to 30% of the budget in some cases, such as extreme offshore drilling. The new low-price environment will drive innovation for reducing the budget for non-productive time during drilling operations.

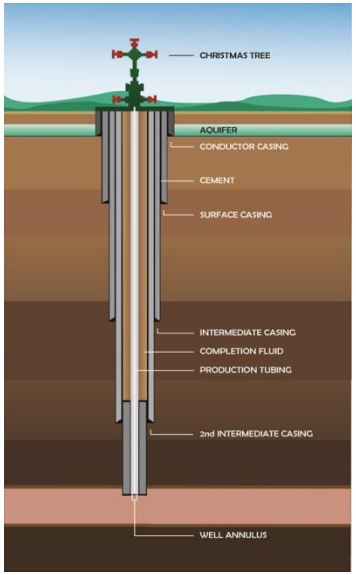
Components of a drilling project



Tangibles: The casing, cement, and completions that remain after the well is completed are considered tangible costs in a drilling program. They will remain on site for the lifetime of the well.

Drilling rig → Drillstring → Fluid system → Casing → Cement → Completions → Contingencies

Intangibles: The drilling rig, drillstring, and fluid system are considered intangible costs of a drilling program. This means that they do not remain on site once the well is completed.



Contingencies: Unexpected failures during drilling operations cost the industry hundreds of millions dollars annually. Reducing probability of these failures is key to successful projects.

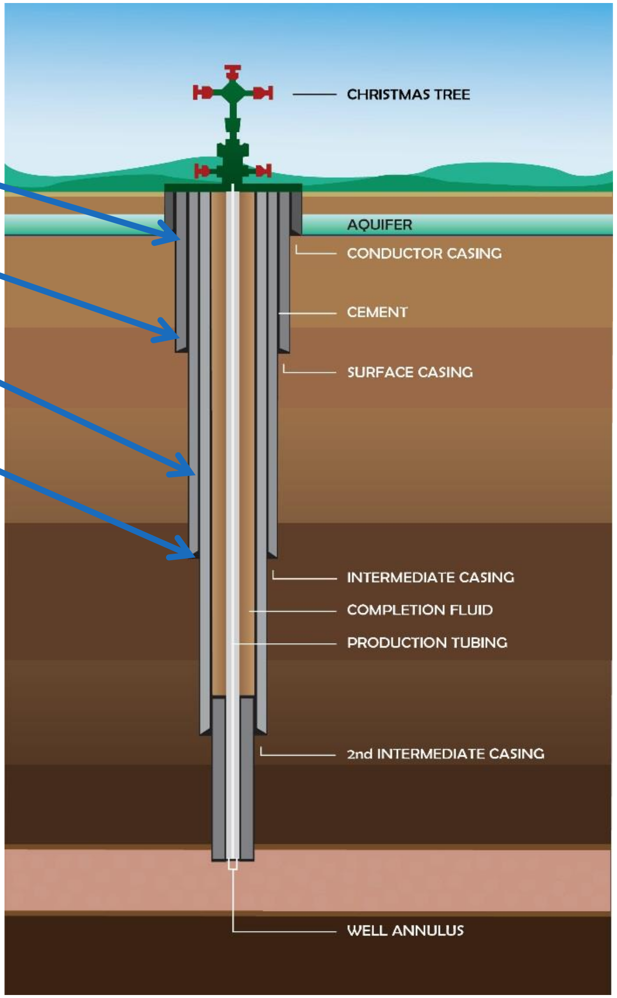
Fluid system

- In addition to the equipment required to drill down into the earth, equipment is also required to circulate drilling fluids. In a standard circulation set-up, the fluid starts in the mud pits. High-powered pumps drive the fluid down the center of the pipe and out the drill bit. The fluid removes rock cuttings generated by the bit and carries them to the surface. This fluid, now laden with rock chips and formation debris, flows out the wellbore and over shale shakers that use vibration and sieves to separate the fluid from the rock and debris. The rock and debris goes into pits or storage tanks for disposal later. The recovered fluid flows through a series of "cleaning" centrifuges and into various pits where it can be treated or mixed with chemicals as needed.
- Drilling fluid and serves three main functions
  - Carries rock cuttings to the surface
  - Provides hydrostatic pressure to the wellbore (well control)
  - Lubricates and cools the bit
- As the borehole deepens, the mud system must adapt to changing rock compositions and formation pressures. A drilling engineer plans out the fluid system in the preliminary stages of the well and the mud engineer fine-tunes the system throughout the drilling process. **Operators pay a premium for these services, which can drastically influence the drilling rate and success of the project. The well in New Mexico spent $55,000 on chemicals and $42,500 on water for the drilling fluid.**

Casing and cement

- Casings are sets of pipe that keep the formation from collapsing in and create a barrier between the wellbore and the rock formations. Operators install casings as the well is drilled, incrementally shrinking the diameter of the well with each new segment.
- Cement is required to keep the casing in place. If the service provider does not properly execute the cement job, remedial operations can cost operators millions of dollars.
- Once the operator has drilled, cemented, and cased the wellbore, it is ready for fracturing or final installation of pumping and flow equipment that will remain onsite for the lifetime of the well. A company addressing this issue, [Dynamic Tubulars], aims to eliminate the "telescoping effect" created by several strings of casing by using expanding steel technology.

Example Costs
20-inch conductor – $28,000
11 3/4-inch surface casing – $11,500
8 4/5-inch intermediate casing – $82,500
Cementing – $100,000
Total – $172,000



Reading the Lux Innovation Grid

We now turn to look at specific start-ups currently offering solutions in the drilling technology space. Drawing from our interviews with executives at these companies and in the industry, we will plot their potential on the Lux Innovation Grid (LIG).

The strength and value of a company's technology determines its Technical Value score. Companies with useful products and services that lower cost, boost performance, or increase revenue are valuable to customers, partners, and investors. The Technical Value score not only takes into account the absolute performance level of a certain solution, but also how it fits with the requirements of the target application.

The completeness of a company's development reflects its Maturity. Mature companies have secured a place and built a presence in the market. Dot size indicates the company's maturity on a scale from 1 (immature) to 5 (developed).

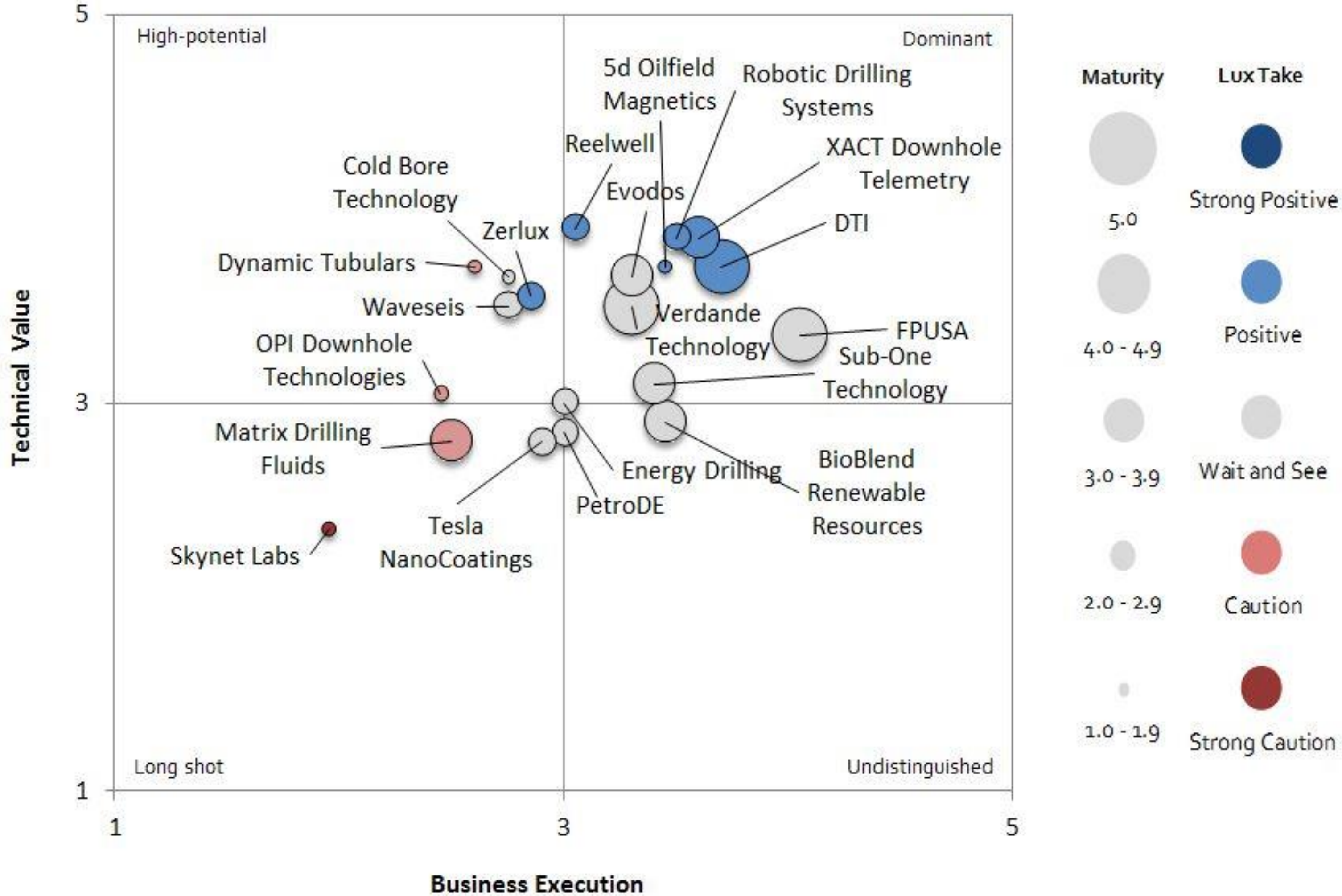
A company's success is measured holistically by the Lux Take. The Lux Take is an overall ranking mechanism based on the considerations taken in the above areas, placing companies into five categories indicated by dot color.

A company's ability to perform and achieve success determines its Business Execution score. Business execution is a measure of the company's ability to run a viable organization, growing sales, managing costs, and making customers and investors happy.

LIG methodology: Quadrants

- "Dominant" companies are top performers.
  - With strong business execution and technical value, these companies make strong partners and good investment targets. Companies in this group were first to the market with disruptive technologies, and are poised for growth. Potential partners should engage quickly as these companies are rapidly maturing; investors will find their best prospects here.
- "High-potential" companies have attractive technologies, but struggle with business execution.
  - This group contains both young companies struggling to gain market share and older companies unable to capitalize on their technologies. These companies are good licensing targets; partnerships or acquisitions should only be considered if the interested party is willing to heavily support product commercialization. Competitors should look for opportunities to acquire technologies from companies in this quadrant.
- "Undistinguished" companies perform well in the market, but lack technical value.
  - These companies lack best-in-class technologies, but have strong business strategies and efficient execution. Companies in this quadrant make good partners, though their limited growth rates make them poor investment targets.
- "Long-shot" companies lag in execution and lack valuable technologies.
  - The combination of poor execution and low technical value make these companies risky as investment, licensing, partnership, and merger or acquisition targets. Companies in this quadrant may not be risky forever, however; they can escape through technological advancements or better-conceived strategies. Companies in this quadrant are also likely to suffer from detrimental regulations in their target application market and those regulations can be quick to change.

Lux Innovation Grid: Comparing drilling cost-optimizing technologies



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High potential in the long run

Company	Application	Target Area	Analysis
Dynamic Tubulars	Developing downhole tubular expansion technology using elastic recovery of high strength steel pipe	Casing	The idea of using elastic recovery for casing would be a viable technology, but Dynamic Tubulars has only managed to finesse 80% of the equipment design .
Cold Bore Technology	Provides sonic transmission of data from downhole tools at higher speeds than incumbent methods	Drill string	Cold Bore could increase kick detection by providing more data points at faster speeds, but will have to stay competitive price-wise with other data transmission methods.
Zerlux	High-powered laser for well stimulation and scale removal	Drill string, completions	Using lasers reduces bit wear. Additionally, the application for scale removal can extend the lifetime of completions infrastructure.
Waveseis	Seismic imaging of sub-salt structures	Contingencies	The only major barrier for Waveseis will be securing clients in a low oil price environment.
OPI Downhole Technology	Developing vibration energy harvesting	Drill string	If OPI's technology fails downhole, the tools would be left without a power source and cause NPT itself.

Thank you for downloading this Lux Research Exploration and Production Intelligence research sample, which contains selected pages from our **30-page** research document "Identifying Ways to Reduce Drilling Budgets in the Low Oil Price Environment."

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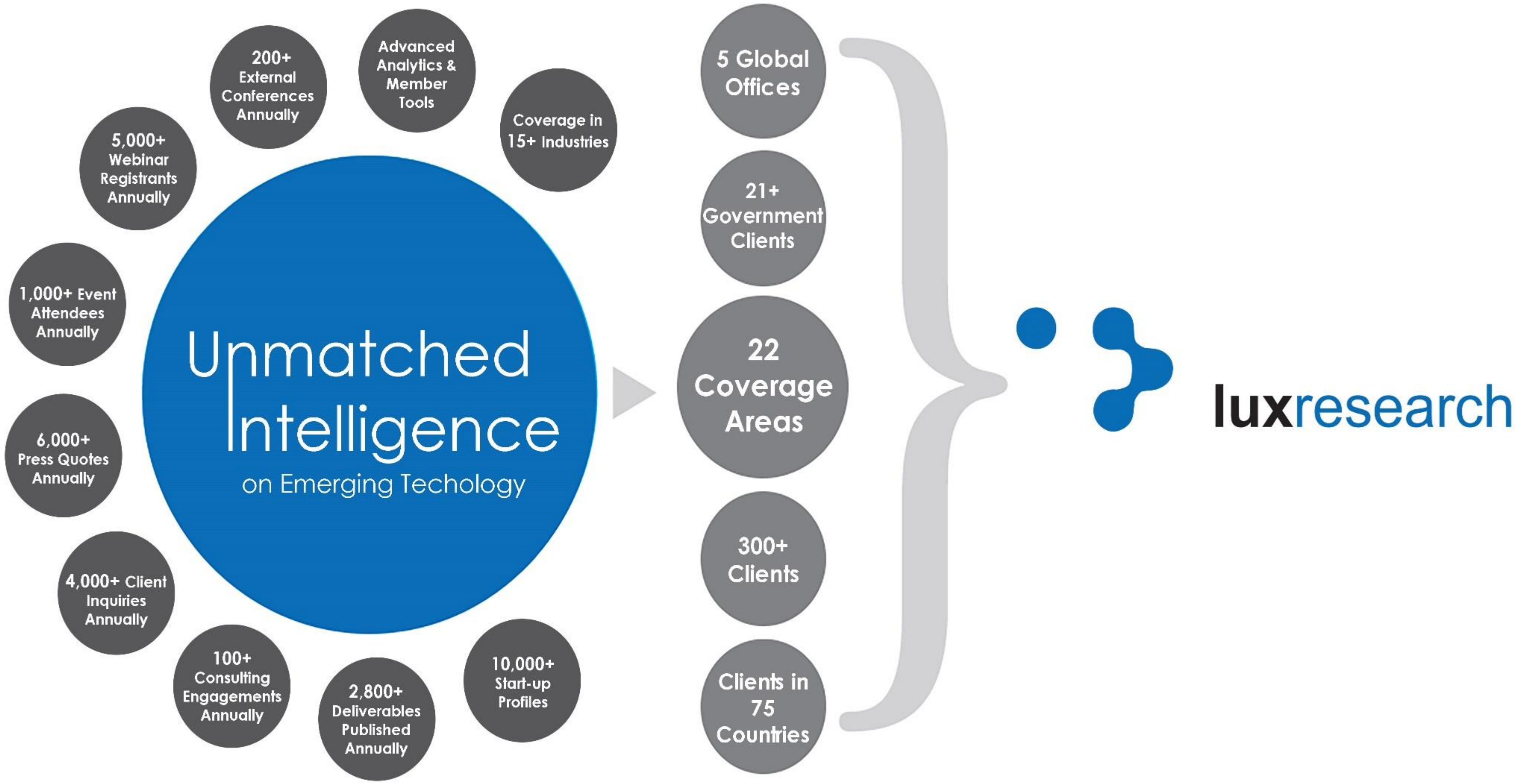

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