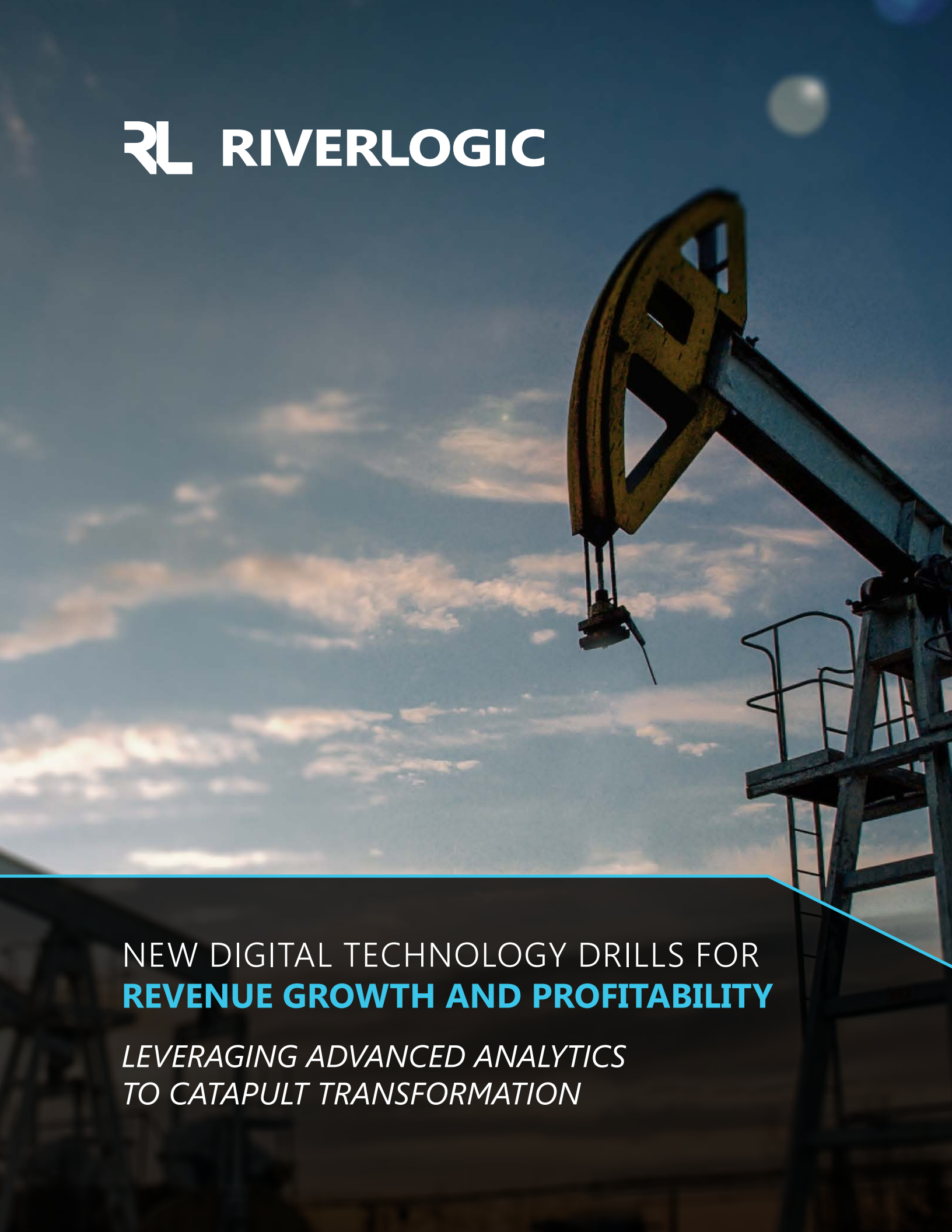

RIVERLOGIC

NEW DIGITAL TECHNOLOGY DRILLS FOR **REVENUE GROWTH AND PROFITABILITY**

LEVERAGING ADVANCED ANALYTICS TO CATAPULT TRANSFORMATION

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A NEW NARRATIVE IN **OIL & GAS DIGITIZATION**

THERE'S A SAYING IN THE OILFIELD: when times are good, they're good, when they're bad, they're *really* bad. This is the sentiment that one business line leader shared during recent down times and is something he's experienced many times before. That is, until he implemented an advanced analytics solution that enabled him to kiss that "what should I do?" panic goodbye.

Up until then, Steve, responsible for his company's trading platform, relied on the same tools that almost all traders use today: numerous Excel spreadsheets linked with clunky custom coding that limited his team's ability to make intelligent decisions within an adequate timeframe. Furthermore, even when they could support a decision within an acceptable timeframe, the difficulty of understanding the complex code meant traders resisted adopting the recommendations from their models. He worked largely off of gut feelings, thus he never really knew *the best way* to adapt to the ever-evolving dynamics of the Energy industry.

Steve knew there had to be a better way, so he went on the search for a technology that (he hoped) could fulfill their needs. He wanted something that could:

- Recommend a course of action on anything from day-to-day decision-making challenges to long-term, strategic ones.
- Bring together different aspects of his business – origination, logistics/capacity commitments, and arbitrage to enable visibility into key trade-offs. For example, "where can I lose $4, so I can make $10 elsewhere?"
- Handle decisions that were highly complex, involving thousands of variables, ever-changing constraints, and cross-functional objectives.
- Enable scenario analysis so traders and logistics managers could test the impact of their decisions across their entire value chain before making a commitment.
- Provide a user experience with sufficient transparency that the trading team would use as a tool and accept the recommendations.
- Enable them to do all of this in a minimal amount of time – hours and days, rather than weeks and months.

Finally, Steve found the one thing that satisfied his needs: prescriptive analytics. Specifically, Steve found an optimization-based prescriptive solution that enabled him to optimize his end-to-end value chain. In just 4 months, he saw a value delivered that he'd never seen before:

- More than $25M USD in additional profits identified in the first two months of trading use, which was previously unattainable by conventional means.
- Traders, empowered to evaluate potential opportunities faster, captured existing difficult trades which led to significant new revenues.
- Realized an overall expectation of 5-8% of revenue in profit improvement and 2-5% revenue growth.
- Established a transparent mechanism to understand and benchmark the performance of traders.
- Expected net-back improvement of $.01 to $.02 per gallon, leading to $14M to $28M in additional annual profit.
- Marginal contribution (net of opportunity cost) identified by product, customer, asset, time period, and contract for different sets of assumptions (scenarios).
- Improved clarity in the decision-making process and reduced time to analyze trading opportunities, options, etc.
- Targeted delivery of incremental profit through marginal improvements.

Steve's confidence in prescriptive analytics soared. With constant volatility in pricing and availability of resources, he had the perfect technology to mitigate the many rapid changes of his industry. It enabled his team to make the best possible decision that maximized their KPI and financial performance, while also considering arbitrage and logistics opportunities, constraints, and proper management of their risk exposure.

With this transformation, Steve is now considered a thought-leader within his company. His team operates on a higher-level of possibilities, better prepared for what the future holds.

YOUR COMPREHENSIVE GUIDE **TO PRESCRIPTIVE ANALYTICS**

Nowadays, with the rise of so many new innovative technologies like Big Data, Machine Learning, AI, etc., it's often difficult to discern the difference between them all. Even more so, it's difficult to understand when each type of technology or capability is relevant/applicable to the problem you're trying to solve. These, among several others, are the questions we'll be addressing with respect to prescriptive analytics in this white paper:

- What is prescriptive analytics?
- What challenges can I address with this type of analytics capability?
- What is the value that the Energy industry has seen from prescriptive analytics projects?
- How do I know I'm ready for such an innovative technology?
- How can I make sure I'm most successful when implementing prescriptive analytics?

IoT, MACHINE LEARNING, ANALYTICS **...WHICH ONE DO I NEED TODAY?**

First, let's talk about business analytics in general. Business analytics has long been a workhorse for the oil and gas industry. Historical data provides good insights, amplified by the arrival of big data, with its broad range of data sets, data forms, etc. New technologies like machine learning, artificial intelligence, IoT, and virtual reality (VR) have provided the industry with more options, but where does prescriptive analytics fit in? Going back to Steve's story, is it really *the* form of technology that can help business leaders solve their most pressing oil and gas challenges? If so, what value could it deliver to an industry barraged by complexities?

Numerous experts believe that technology will help drive oil and gas transformation with its ability to identify operational efficiencies, as stated in *Deloitte's O&G Outlook 2018*:

"Digital technologies could change everything, resulting in radical efficiency gains and improvements of both top and bottom lines."

John England
Vice Chairman, US Energy & Resources Leader
and US and Americas Oil & Gas Leader
Deloitte LLP

If true, of the many digital technologies out there today, which one can really deliver straightforward answers to your most complex questions? ***The answer is Prescriptive Analytics.***

Prescriptive analytics is the only form of technology on the market today that can harness all of the complex data within the Energy industry and address business leaders' most pressing current and future challenges. Even with the broad swath of complexities and ever-increasing amounts of data, it is the only form of analytics that can provide a recommended, optimal path forward for the challenges at hand. More importantly, it does so within the constraints of your value chain, while meeting your financial and operational objectives simultaneously.

WHAT EXACTLY IS **PRESCRIPTIVE ANALYTICS?**

Imagine someone named Jim — he's a Well Site Supervisor in the Exploration and Production (E&P) unit of an energy company and oversees the production and maintenance of several producing oil wells.

Many times, over the past year, Jim has struggled to keep up with maintaining his wells at the optimal efficiency. Fortunately, Jim's company utilizes a software package that allows him to see his past drilling data, in addition to some of his operations data. That type of data is what we call descriptive analytics — it essentially tells Jim "what happened" in his business unit.

He can also see operational data like downhole equipment failure. This type of analytics is diagnostic in nature, because it tells Jim why something happened.

With limited success, Jim's IT Department has completed some additional analysis by taking all the data captured in a well's lifecycle and conducted some programming using the open-sourced language called R. R is the most used statistical programming tool in the world, helping Jim see things such as "approximate mean time to failure" for some of his downhole equipment. This type of statistical forecasting is referred to as predictive analytics. It can use probabilities, for example, to answer the question of "what might happen?"

Despite Jim's descriptive, diagnostic, and predictive analytics capabilities, he *still* doesn't really have straightforward answers that tell him *the best path forward.* He still struggles with questions like: "How do I deploy the right personnel, to the right well, at the right time, with the right equipment?" Furthermore, he needs to understand how to do so while maximizing the efficiency of the overall production field. That's where prescriptive analytics comes in. Prescriptive analytics tells Jim the best path forward given his business realities and it allows him to optimize his many business objectives without having to do guesswork.

WHY PRESCRIPTIVE ANALYTICS *IS* THE **OIL & GAS DIGITAL TRANSFORMATION**

Few industries pivot on the axis of global impacts like oil and gas. As the price of a barrel of oil inches upward every year, 2018 marks the first time that it's reached $70 since December 2014. While good news, the industry, prudent by the past, knows increases in pricing alone won't solve the challenges at hand such as:

- Preparing for future uncertainties that may affect one or more areas: upstream, midstream, and downstream.
- Dealing with complex, volatile pricing.
- Achieving maximum resource efficiency, considering the resource tradeoffs across the many functional areas, such as exploration, production, refining, petrochemicals, logistics and retail.
- With the advent of new energy types that are moving demand away from fossil fuels and into renewables like wind and solar, understanding when to change course in strategy.
- Handling the increased pressure to make better decisions, with the ever-increasing capital-intensive operations and supply and demand risks — a situation which affects all sectors.
- Quickly and effectively moving to new, sustainable energy sources while also making sure that traditional energy sources are cleaner.
- The rising demand for electric vehicles that is set to create what some are calling an "energy-demand time bomb."

COMMON OIL AND GAS CHALLENGES, **SOLVED BY PRESCRIPTIVE ANALYTICS**

Of all forms of business analytics, prescriptive analytics is the one that drives the most value for companies, both operationally and financially. It does this by improving process efficiencies, eliminating spreadsheets, and allocating spared resources elsewhere. Prescriptive analytics has been known to reduce addressable costs by as much as 15%, and more importantly, add significant profits when applied against commercial and supply functions simultaneously!

Prescriptive analytics can help you answer questions that other forms of analytics can't. In essence, it gives you the optimal solution. The following table presents some unique questions that companies who implement prescriptive analytics are able to answer:

USE CASE	UNIQUE QUESTIONS ANSWERED BY PRESCRIPTIVE	VALUE ADDED
PRODUCTION	› How do we maximize production and throughput? › How do we prioritize crew work assignments given predictive data about well performance? › What is the most efficient way to logistically support offshore platforms?	› Quickly add "what if" scenarios and compare the results to the baseline. › Reduce logistics costs and inventory. › Reduce manpower costs through more efficient staffing. › Ability to analyze impacts and prepare for potential market disruption events such as pipeline, port, and terminal outages (i.e. Hurricanes, leaks, and turnarounds). › Make investment decisions based on an economic model that is integrated with your current portfolio. › Assess impacts of acquisitions and repurposing of assets quickly. › Incorporate financial ratios as constraints or targets into the optimization results.
PETROCHEMICALS	› How do we optimize capacity use and product mix to maximize overall profit? › How do we balance maintenance upgrades with a shortage of skilled labor?	› Identify cross-BU optimization opportunities where independent P&L's may not lead to optimal company-wide results. › Reduce logistics costs and inventory. › Reduce manpower costs through more efficient staffing. › Make investment decisions based on an economic model that is integrated with your current portfolio. › Assess impacts of acquisitions and repurposing of assets quickly. › Incorporate financial ratios as constraints or targets into the optimization results.

USE CASE	UNIQUE QUESTIONS ANSWERED BY PRESCRIPTIVE	VALUE ADDED
DRILLING	› What is the best strategy to develop a field? › How do we improve net drilling income growth by minimizing what costs? › How can we ensure drilling crews are always working on the right priorities?	› Reduce logistics costs and inventory. › Reduce manpower costs through more efficient staffing. › Make investment decisions based on an economic model that is integrated with your current portfolio. › Assess impacts of acquisitions and repurposing of assets quickly. › Incorporate financial ratios as constraints or targets into the optimization results. › Optimal routing and schedule produced by the model can be used for nominations and dispatch.
PIPELINE & TRANSPORTATION	› How do we ensure better manage the distribution of increased production with the same quantity of options? › What are the routes and shipping assignments that maximize profit contribution?	› Forward view of portfolio without having to schedule the activity in an ETRM. › Reduction in spreadsheets and difficult to maintain macros/programming. › Optimal purchase and sales timing and locations. › Identify cross-BU optimization opportunities where independent P&L's may not lead to optimal company-wide results.
EXPLORATION	› How do we reduce costs and consider other possibilities like new environments and new extraction techniques?	› Reduce logistics costs and inventory. › Reduce manpower costs through more efficient staffing. › Make investment decisions based on an economic model that is integrated with your current portfolio. › Assess impacts of acquisitions and repurposing of assets quickly. › Incorporate financial ratios as constraints or targets into the optimization results. › Identify cross-BU optimization opportunities where independent P&L's may not lead to optimal company-wide results.

USE CASE	UNIQUE QUESTIONS ANSWERED BY PRESCRIPTIVE	VALUE ADDED
REFINING	› Which capital expenditures will yield the most value? › What blend should we purchase that would yield maximum profit across our refineries?	› Reduce logistics costs and inventory. › Reduce manpower costs through more efficient staffing. › Optimal routing and schedule produced by the model can be used for nominations and dispatch.
TRADING AND LOGISTICS	› What contract terms should we undertake to maximize profit contribution? › What nominations should we make to secure capacity at lowest cost? › How do we maximize our ability to take advantage of arbitrage opportunities?	› Forward view of portfolio without having to schedule the activity in an ETRM. › Reduce logistics costs and inventory. › Reduce manpower costs through more efficient staffing. › Least cost routing and utilization of transportation assets and agreements. › Optimal purchase and sales timing and locations. › Reduction in spreadsheets and difficult to maintain macros/ programming. › Optimal routing and schedule produced by the model can be used for nominations and dispatch. › Quickly add “what if” scenarios and compare the results to the baseline. › Ability to analyze impacts and prepare for potential market disruption events such as pipeline, port, and terminal outages (i.e. Hurricanes, leaks, turnarounds). › Identify cross-BU optimization opportunities where independent P&L’s may not lead to optimal company-wide results.
OFF-SHORE PLATFORM DECOMMISSIONING	› How can we minimize the rental costs of the vessels required to plug the wells by optimizing routes and minimizing rental duration times?	› Quickly add “what if” scenarios and compare the results to the baseline. › Reduce logistics costs and inventory. › Reduce manpower costs through more efficient staffing. › Ability to analyze impacts and prepare for potential market disruption events such as pipeline, port, and terminal outages (i.e. Hurricanes, leaks, and turnarounds). › Identify cross-BU optimization opportunities where independent P&L’s may not lead to optimal company-wide results.

WHERE ELSE **CAN I LOOK?**

While the previous table provides a comprehensive view of eight major areas where prescriptive analytics can successfully be applied, there are an endless number of areas you can look to improve your business decision making with prescriptive analytics. Here are some pointers of where to look first when you're on the hunt for your first prescriptive analytics use case:

1. Policies that guide behavior, where decisions are made out of habit or people fail to even make decisions.
2. On-going and complex planning processes that are treated sequentially or that are made in isolation. These could be tactical and strategic decisions involving resources, product/service mix, marketing, transportation, etc. that are made solely within one silo of the business.
3. Highly dynamic situations where input/product prices change constantly and regulations evolve.
4. Anywhere that has a high difference in average versus marginal decision making. There can often be up to 100% difference in average versus marginal profitability for the same commodity.

THIS SEEMS REALLY COMPLEX...**AM I REALLY READY?**

It's understandable that this type of endeavor may seem daunting, but truly innovative companies have placed their doubts aside and quickly learned that prescriptive analytics is, in fact, accessible to just about any company, at any phase of maturity.

Below, we've outlined some of the concerns you might have and addressed the reality of each situation:

YOUR **CONCERNS**	THE ***REALITY***
"I DON'T HAVE THE DATA." OR "MY DATA ISN'T PERFECTLY CLEAN."	Most companies implement a crawl, walk, run approach with prescriptive analytics projects. Pay attention to the data you have. Even if it's not perfect, there are industry averages that can be utilized for certain data points. Further, prescriptive models will help you focus on getting the right data that's relevant to your model, as opposed just any data.
"WE DON'T EVEN HAVE PREDICTIVE ANALYTICS, WE'RE NOT READY FOR PRESCRIPTIVE."	Contrary to popular belief, there is no requirement for having predictive capabilities in place in order to run prescriptive analytics. The models work with the data that is available — regardless of whether it be descriptive, diagnostic, or predictive data.
"I'M IN THE MIDDLE OF A BIG PROJECT RIGHT NOW, AND IT'S AN IT NIGHTMARE."	Be careful with this mentality. As stated above, many companies enforce a crawl, walk, run approach when first exploring prescriptive analytics. Unlike other projects that can be an IT nightmare and take years to fully implement/produce ROI, if the appropriate technology is selected, a prescriptive analytics project can come together in just a few months.
"I DON'T WANT TO HIRE A TEAM OF DATA SCIENTISTS."	This concern is covered in the section below, in which we give some advice on selecting the best technology for the job. In short, it's crucial that a technology is selected that does not require a team (or even one!) of Data Scientists. The best prescriptive analytics technology will have modeling capabilities that are accessible to a Business Analyst type of role — capabilities that avoid the need for coding.

It's not uncommon to have hesitations when it comes to any new form of technology or capability. However, the ROI from prescriptive analytics vastly outweighs any amount of "heavy lifting" that is required — especially if you follow a few key best practices.

HOW TO ENSURE SUCCESS WHEN **IMPLEMENTING PRESCRIPTIVE ANALYTICS**

The following best practices are based on over 100 successful implementations of prescriptive analytics across dozens of verticals — Energy being one them. These methods will ensure that your project, whether it be a pilot project or a full implementation, achieves the highest ROI in a minimum amount of time and with the least amount of resources possible.

FIRST

Define a problem that is of high value to solve, yet can be achieved relatively quickly so you can have a quick win. Remember, common ROIs range from 10-15X within the first year.

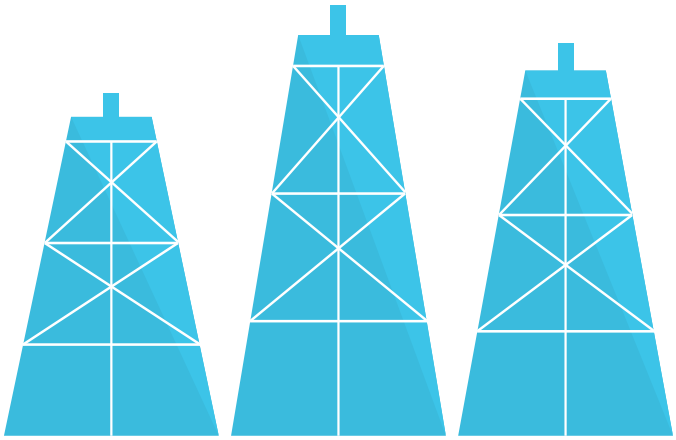
SECOND

Structure participation to include business leaders (so they get exposure to the potential), subject matter experts in the problem being solved, IT/data engineers, and the business people that would ultimately use the system. This is critical to ensure not only a successful pilot but also to maximize the chance of success in moving from pilot to production.

THIRD

Identify the right technology, which should include:

- Flexible modeling tools that let you quickly represent your business and adjust underlying assumptions, objectives, variables, constraints, etc.
- You want this in the hands of your business users. First, find a solution that has a business-user friendly experience. Secondly, that allows for full visibility into the "why" and "how" of underlying scenarios/optimization runs, and that can be easily embedded into a business process.
- Given the complexity of the Energy industry, the software must have powerful modeling capabilities. It must also be able to handle thousands of variables and constraints while respecting multiple objective functions, not just one. Just as importantly, it should be easy to tie the process with financials.
- Speed is essential. You need something that minimizes the programming to allow you to pilot within weeks and go into production within months.



OFTENTIMES, IT'S BEST TO LEVERAGE A CONSULTING FIRM TO HELP YOU FIND THE LOW-HANGING FRUIT THAT WILL DELIVER HIGH ROI WITH AS LITTLE INVESTMENT AS POSSIBLE.

IF THIS IS THE CASE, FIND A CONSULTING FIRM THAT WILL FOCUS AS MUCH ON PROBLEM DEFINITION AND ENSURE THEY WILL NOT BE PROGRAMMING YOUR MODEL. ANYTHING LONGER THAN 4 WEEKS IS TOO LONG FOR A PILOT!

CLOSING **REMARKS**

The Oil and Gas sector is forever changing and does not have an end in sight. The gap between industry leaders and the non-leading companies continues to widen. Digitization is no longer a thing of the future; it is a thing of today. The most successful companies are already employing tactics that don't just cut costs but actually improve efficiencies. Prescriptive analytics has the potential to disrupt the way Oil and Gas companies run — it already has. By 2020, 40% of small to mid-sized companies will already have prescriptive analytics. Today, 20% of them use some form of prescriptive technology. Ask yourselves: Do you want to lag behind, or do you want to innovate?

ABOUT **THE AUTHOR**

River Logic is a Gartner-ranked leader in the prescriptive analytics technology space. With a mission to change the way companies make decisions — from "what-if" to "what's best" to "what's feasible" — we focus on bringing optimization-based prescriptive analytics into the hands of business executives. The days of code-based optimization modeling and silo'd planning are over. We are here to be the trusted source of truth for all business decision makers by modernizing the decision-making status quo and by bringing collaboration and optimization to every value chain.

ADDITIONAL **RESOURCES**

If you're interested in additional information on the category of prescriptive analytics, we suggest the following resources:

Reach out to Gartner, IDC, or other analyst research firms with questions.

Flip through "**Prescriptive Analytics for Business Leaders**," the first e-book on the category that is specifically written for business leaders rather than Data Scientists .

Talk to one of the leading partners in Oil & Gas who are currently implementing prescriptive analytics projects. A few of the bigger Consulting Firms include **CGI Global** and **Opportune LLP**.

Contact River Logic's leadership team, some of whom have been working in the prescriptive space for 25+ years.

Watch a handful of educational videos that help answer questions like "**Are You ready to Implement Prescriptive Analytics?**" or "**What Exactly is Prescriptive Analytics?**"

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*Zema (industry-leading software that consolidates hundreds of unique data sources, as well as thousands of market data reports, to give the user information to mitigate risk and a view of an overall market)