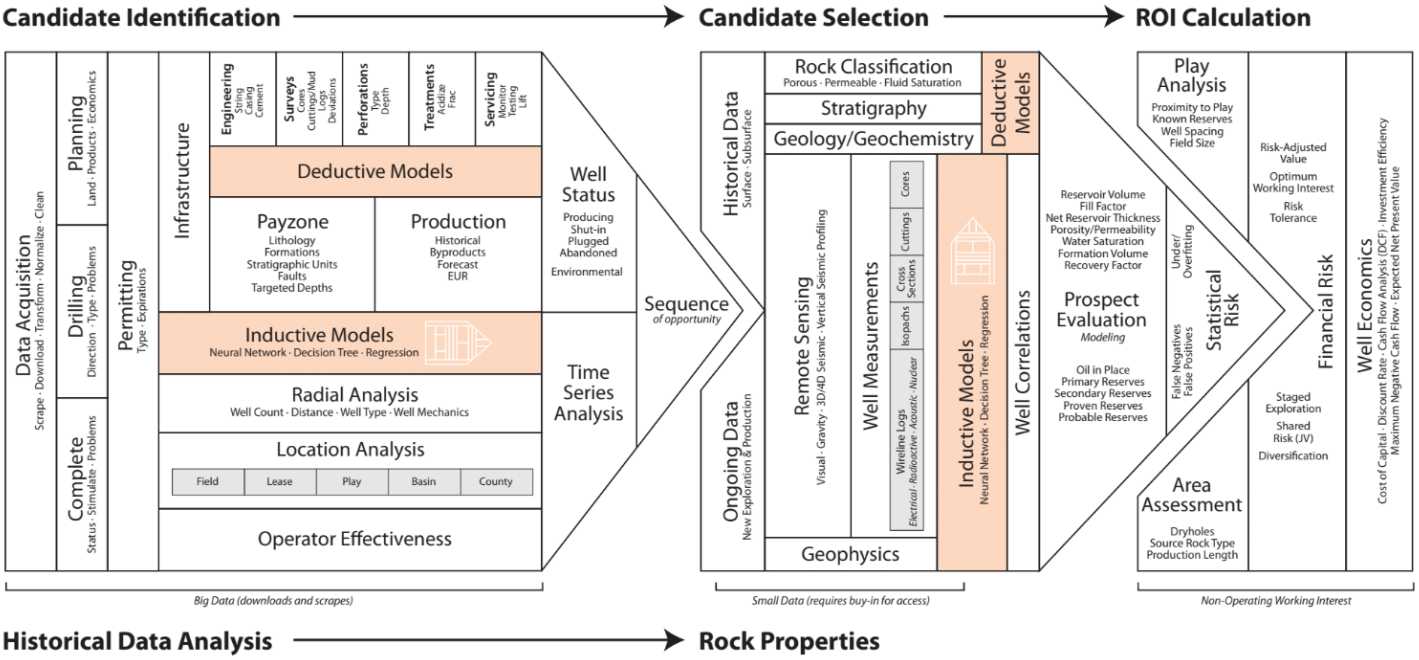
DATA SCIENCE OVERRIDING LOYALTY (DSOR)

EXPLORATION VALUE CHAIN



The exploration value chain has three major components: candidate identification, candidate selection and finance. The goal of this project is to automate candidate identification and produce a sequenced list of the best to worst acreage for drilling and completion. This is not a tool or user interface. It's a black box the crunches the data and produces a "term" sheet (narrative) for each potential location. These locations then go to Geology, Geophysics and Engineering (GG&E) for prospect validation and final go/no go decisions.

SUCCESS IN A FEW WORDS

Intelligible. There can be no success without an expert, the client, understanding and blessing the models. "We trust that this looks reasonable." Complex models, that cannot be explained, will not be embraced. Transparency is key, even at the expense of model sophistication. No understanding, no client, no business.

Relationships. Lead generation is not about any data value, regardless of its significance alone. It's not about the analysis of values in a single data field. It's about the relationship between values from different data fields – spatially, stratigraphically and over time.

Patterns. Relationships between different data fields are non-obvious. Computers are better at finding and even interpreting these relationships, often overlooked by humans. But computers need very large datasets to tease out meaningful patterns.

Anomalous. High producing and opportunistic are not the same thing. Opportunity is success that has not been realized yet. Once a pattern is found that describes success, opportunity is found, not by looking for where that pattern repeats, but in looking for anomalies – failures that disrupt that successful patterns? A collection of anomalies leads to a deeper explanation and better grading of each location.

Other terms: geography agnostic, enterprise-wide data, top of funnel, anomaly hunting, story of the acreage

ELEVATOR PITCH

For: small to midsize operators and investors wanting to maximize wellbore ROI

Who are dissatisfied with: large companies having a "statistical analysis" advantage over them

DSOR is an: O&G exploration lead generation tool using advanced data science technologies

That provides: a meta-analysis of 2MM+ wellbore locations to grade undervalued oil and gas acreage

Unlike: top-down, labor-intensive AOI analysis of smaller areas, one at a time, for go/no go decisions

DSOR: analyzes 2MM+ locations and puts them in a sequenced order from most opportunistic to least

5 MINUTE PITCH

Problem Statement

Data-driven decision making is impacting every industry. O&G is lagging because past tech innovation has mainly focused on enhancing production (hardware), not improving exploration methods (software). The largest companies recognize this and are investing heavily in statistical analysis. This investment is increasing inequality between large and small competitors.

Expand on Problem

Engineers have no time to study/research tech innovation. I.T. is not incented to offer innovation that will increase their workload. Vendors try to fill this void, but their tools are very complex to learn and only partial solutions. Basic tools, like Excel, fill the void, but are too basic to drive real innovation.

Differentiate

Engineers start with raw data, analyze it and make recommendations to drill. Part of this analysis can be automated and done at very large scale. Objective analysis with no biases, not limited by geography, that discover opportunities bypassed by focused, top-down, AOI-centric engineering functions.

Close

Marketing of drilling prospects, giving overriding royalties and using data science at large companies are all common practice. Engineering need for O&G data has created a $1B+ subscription market. Data is heavily correlated to exploration. The tools market is robust. But there is a disconnect between what engineers need and what's available. We can fill that gap by using automation to identify better drilling locations.

OPPORTUNITY ALGORITHM IDEAS

Gas behind the pipe

Mismarked formations

Pughed out

New lease analysis

EUR aggregated view

M&A

Land lifecycle and perforation densities

Permit-to-production latency tracking

Anomalous production profiles and layer complexity

Secondary market well purchasing – pump stroke optimization

Anomaly aggregation

Satellite image recognition

Operator effectiveness (minus filing effectiveness)

Second-hand seismic data availability

Infrastructure costs (sequencer algorithm)

SUMMARY OF PHONE CALL NOTES

*Detail notes are in a separate document

1. This is nothing new. It's replicating what the largest companies are doing, just for their smaller competitors. This is an "as-a-service" offering that is gaining popularity in other industries.

2. Prospect and lead are different terms. Prospecting requires GG&E. which is expensive and time-consuming. Lead generation helps direct and improve the ROI of prospect generation.

3. GG&E tends to specialize in AOIs, which requires months/years to build localized expertise. Interpretive geologists have district managers. Managers have expectations and biases.

4. Large operators are making huge investments in statistical analysis. They are shifting from exploration to pure engineering. Smaller companies don't realize they need this capability yet and are being left behind.

5. Existing technologies are data anemic. Row counts are limited by applications to better serve large audiences. Visual user interfaces further reduce the amount of data in any single AOI. Engineers can only view small AOIs because visual complexity in the user interface requires too much CPU/bandwidth.

6. Tools expect clean and curated data to function properly. This is not always the case with industry tools.

7. Major basins and plays, especially in Texas, may be so saturated with enthusiasm, this service may not be as needed. Land outside the Permian+ gets much less analysis. Offering may be the perfect fit for operators not in major discovery areas.

8. Time series analysis is critical. We need to tell the story of the land over time. Analyzing each event, time between events and how each event relates to the past and present is a key part of the value proposition.

9. Azimuth analysis is also critical. Algorithms need to be "directionally aware." What's the relationship between these wells, along this path. We are hunting for anomalies over time, place, depth and vector.

10. Watch out for land that has changed hands many times. It may be "worked to death." Each new owner has brought a slightly different interpretation to the acreage and there may be nothing left to add.

11. Look at perforation activity in the aggregate and over time. What's the producible density? What's the production over perforation density? Has the location been over-perforated?

12. Build and study production profiles spatially and over time. This can reveal "layer complexity." Look for underperformance relative to high performance, not just at absolute performance.

13. Don't mistake "bad filing" for poor performance. Study filings at scale to better understand operators.

14. Timing is good. Data science, machine learning and artificial intelligence are impacting every industry. All need large datasets to detect patterns and create optimizations. O&G has a very large dataset.

15. There are multiple client types for this service – 2nd and 3rd tier operators, smaller investment/private equity firms and mineral right buyers. Finance may be the best option. They can put money into any wellbore location, producing or not, and often struggle getting unbiased opinions from those pitching opportunities.

16. Sequencer will generate empirical "term sheets" with narratives explaining each location recommendation. Location identifiers will be redacted. Clients sign strict NDAs and get "first look" at opportunities in geographies where they do business. If client decides to pass, we can present it to someone else.

17. The offering is unbiased and totally objective. It looks at all the data for more than 2MM wellbores and sequences locations based on opportunity for future production. Only then do we seek out clients, with localized expertise, who can review the top locations for go/no go from our sequencer.

18. Mining unstructured data may drive a large piece of the value proposition. Most engineering teams and even statistical analysis teams never put eyes on this data because it's buried in PDF documents.

19. Don't ignore gas properties. If the economics are right, they can be very profitable.

20. O&G engineering teams are limited by how many go/no go decisions they can make in a year. Areas of Interest are chosen in advance to focus team efforts. AOIs can miss nearby, high value locations.

21. This idea only needs to tread water long enough for quantum computers to reach the cloud. Data feature extraction/generation is critical to both machine learning and quantum optimization problems. Early work puts us on the starting line, ready to leverage quantum from day one. First mover advantage will be huge.

22. This idea will probably start in conventional re-completes. Verticals are still popular, a lot cheaper to drill, and will benefit from this type of data analysis.

23. Not all operators and engineers are equal in capability. SLB and others already look for underperforming operators, then offer to take over existing production and increase ROI for all stakeholders.

24. O&G is still searching for the right tool(s). No agreed-upon, best practice, tool has emerged. Perhaps tools were never the answer. This generation expects computers to pre-process data and drive decision making.

25. Not all data has to be clean. We need to know what's clean and what's not. Then we need to assign an "inaccuracy probability" to all unclean data. We analyze clean data. We look for deeper meaning in the unclean data.

RESEARCH FROM AROUND THE WEB

DrillingInfo Graded Acreage [Link]

1. DI is using geologic + operator data as the independent variables and production as the dependent variable.
   a. Interestingly, DI ignores multi-well leases because of allocation problems.
   b. Max month production (~2nd month) is used as production measure (dependent variable)
2. They assign a grade, A through J, to each square mile of acreage. A is the best acreage.
   a. Looks like DI considers azimuth and well spacing in models.
   b. They choose 10 variables out of 100+, but I wonder how these 10-change based on location/time?
   c. They really do set aside the operator, "identical fashion", in this grading system.
3. Q: Are geologic parameters constant within a square mile?
4. Geology can be good, but operator makes drilling and completion mistakes that result in lower production.
5. DI is using LAS data at very low quantities and interpolating geologic values between the known observations.
   a. Looks like basic statistics are used with the LAS data – no relationships analyzed between tracks.
   b. They are using interpolation techniques to guess additional values and even show a formation pinch out.
6. They analyze frac data, lateral length, and azimuth when wells are unconventional.
7. At different points in the PDF writeup, they mention their "team" which implies this is a human-driven process.
8. Q: Why do they use a 20:1 ratio for gas?

Takeaway: DI is using a manual process that is hard to scale. It appears to be weighted toward geology, just controlling for operator differences. Interpolation is a reasonable idea, but more data is needed. Not sure why DI favors a linear regression. Love the idea of general additive models and adding pairwise interactions to the models. We need to think carefully about doing too much data discretization – there may be some model quality tradeoffs.

Best guess? DI believes a square mile should have consistent production performance and actual performance not meeting that expectation is probably due to operator variability. Part of me thinks "intelligibility" has been a limiting factor for the success of DI's grading offering.

Raisa Energy – Egypt Presentation [Link]

This is a Denver-based company that raised $200MM to use for non-operating working interests, primarily using data science to drive investments. They offshore the data science piece to Egypt. Someone from the data science team gave a presentation in Egypt that reveals some of their strategies.

1. Interested in forecasting the time it will take to drill and complete a well, even applying for a patent on model.
   a. Note: I have searched extensively for patent and cannot find it, no matter what search criteria I use.
2. Best I can tell, U-Net it being used with satellite images to find drilling sites at various stages.
   a. There is a recent paper on this subject that we will be reviewing in detail.
   b. This idea of image recognition may not have come from Raisa, but previous experience.
3. Raisa also forecasts oil prices over life of wells to help compute ROI and NPV.
4. Interestingly, they list earnings calls and presentations as a data source for modeling.
5. They appear to be scraping PDFs and are interested in spacing orders.
6. Raisa does something around density distribution, but does not go into detail.
7. Raisa resumes also hold some clues on what they are doing.
   a. Looks like they rely on visual interfaces versus pure number crunching.
   b. They are using Spotfire (and Aries) for some of their analysis.
   c. Looks like they will buy already producing wells, relying on decline curve analysis and IHS data.

Takeaway: I have this feeling that Raisa is using computers for decision support around candidate selection – and not as much around lead identification. Time to first production is an indicator that maximizing early ROI is key.

Prospect Marketing [and Generation] Companies

1. We are challenging this idea > "Most generating geologists have knowledge of a specific oil and gas basin or geographic region." Can we do candidate identification (not selection) at scale without this area knowledge.
2. The prospecting business model is sustainable over long periods of time. This company was started in 1985 and like all others picks the target, then does deep GG&E analysis.
3. We may build our models using Texas data, but it maybe be an easier sell, to start, in smaller states.
4. There may be brokers in the industry that mainly connect prospects with investor money.
5. Noticing the companies who do prospecting are led by or have a large number of landmen on staff.
6. Here is an example where the company talks about "ranking" fields, but again, in a targeted area.
7. This company does private placements through a licensed securities firm to fund prospects.
8. It is possible to buy into an already producing lease.
9. Here's a company that "auctions" prospects. Quality of prospect seems to be between buyer and seller, with marketer just doing the broker/connection piece.
10. Joint ventures are not common, but some will team up with others to deliver services.
11. Companies are small, with very simple websites. And continue to get impression they just sit between the money and those in O&G that need the money. More like a realtor, less like a home builder.
12. Can see the difference between prospect generation and prospect marketing pretty clearly. One calls itself a subsurface consultant. Another uses "drill ready." Generators do leverage existing tools.
13. There's a $125 course on prospect generation. I plan on taking it.
14. "The task of qualifying an oil lead is typically assigned to geologists." < Start with lead, then qualify a prospect.

Takeaway: Candidate identification = leads. Candidate selection = prospect. Marketing appear to sit between prospect and access to investors. Marketers don't really have a stake in the quality of a prospect. It may be necessary to team up with a GG&E firm and take prospects versus leads to potential clients.

Data Science in Oil and Gas Resumes [Link]

1. We may want to research using vector autoregression for trend forecasting of time series data.
2. We will want to take a hard look at Spark for use in our future modelling.
3. Almost every resume talks about clustering or binning data – which is really feature banding.
4. Spatial data analysis seems to be popular.
5. Seeing dimensionality reduction mentioned in quite a few resumes.
6. First resume I have seen that has any mention of "anomaly."
7. We may want to take a closer look at Apache Kafka. It's mentioned in multiple resumes.
8. We may want to investigate inferential statistics?

Takeaway: There are very few data science resumes in the Oil & Gas industry. This is not too surprising. I have a long-held belief that the tech revolution came to O&G in the form of hardware (enhancing production) and not software (e.g. seismic interpretation).

DETAILED NOTES ON SPECIFIC FEEDBACK

Why are we doing phone calls? Taking all these notes?

Failure. We've all known the taste of failure. We know the value of crowd wisdom. And I have personally seen the importance of diversity in the past. We need to beat this idea into the ground and see if it can get back up. We know technology. We don't know O&G. We are bringing this idea to O&G experts for advice and counsel.

Do you have plans for how the idea may go to market?

No. We are 100% focused on the idea right now. The plan is to do more phone calls, research and eventually build a placemat (large blueprint plot). Only if we get good feedback on the placemat will we consider taking the next step. Right now, we are only focused on vetting the idea. Not going forward is absolutely an option.

Is there a good metaphor, easy to understand, for this idea?

Forensics and investigative journalism have been referenced on calls. It's almost like we are writing a book about each location and then generating a (best of) cliff notes version. Each location has the same chapter titles, but the contents are different. We are telling the story of a location in three main parts: Who touched the location? How was the location touched? What was the quality of who touched the location. Touch is the right word because we are looking much deeper than major location events.

TIMING

Issue: I have been seeing the promise of data for decades. And I have yet to be blown away.

Things are changing with the large players. There has been a slow, somewhat increasing interest for data science over many years, but most agree the last few years have been different. We are seeing a real acceleration into data science. Siri, Alexa. Alpha Go, IBM Watson are all making data science more mainstream.

Data science is reaching a tipping point across all industries. Data scientist is at the top of everyone's best job lists. Statistician too. A second reason? O&G has put most of their "technology" spend into hardware. These innovations have been significant but are slowing down. There is now more room in the budget for data science. Finally, data is already big business. We estimate IHS is selling almost $700M in annuity subscriptions.

Issue: How do you know things are changing within the larger companies?

We read O&G resumes looking for data science terms. Here is an example from Chevron. Even the USGS is experimenting with machine learning. Mainly we are seeing data science focused on reading seismic data. Here is how Shell is working with MIT.

We also interviewed someone who sold data tools to very large companies. We hear that Pioneer is a leader with statistical analysis running across the entire Permian. EOG, OXY and others are heavily investing too. Schlumberger has an entire team tasked with finding under-performing operators and taking over leases.

Issue: Unconventional is big. Who cares about exploration anymore? It's all about steering drills now.

In Texas alone, since 1/1/2018, there have been 5,383 new drill completions and 1,084 recompletions. FracFocus reports only 2,849 of these 2018 completions are fracs. Conventional drilling is still significant.

And conventional is where we will start. We will target operators who like to recomplete and verticals. These are much cheaper wells to drill and lend themselves to data science, to exploration algorithms.

Issue: What's the hook? What makes this idea different from everything I've heard this week?

"Every prospect starts with a geological idea." This is a human limitation. "Most generating geologists have knowledge of a specific oil and gas basin or geographic region." We plan to take advantage of these limitations and process (at scale) every geography for lead generation. Then turn these leads over to local, human experts.

There is no magic bullet. No algorithm better than all others. It's the combining of these algorithms (meta-analysis and additive models) into a single grade that is the value proposition. Is there consensus on where to drill? Therefore, we openly discuss each algorithm – nothing groundbreaking at this level. Meta-analysis is the secret sauce. Finally, this offering is neutral, unbiased and consistent. It's a straight optimization solution.

Issue: Is this really the right time to attempt this idea?

No. It's about 2-3 years too early. None of this work will lead to instant riches. It's all precursor for quantum computing. Quantum is designed for optimization problems. What will take a classical computer a year to accomplish, quantum will have done in 7.3 milliseconds. But quantum is hard to use and will need lots of data. The pre-quantum years of this idea are to just be one of the few ready at the quantum starting line.

The impact of quantum cannot be underestimated. In about an hour, it will set insurance premium levels for every home in California. In hour two, it will rewrite every home building code to minimize those premiums. It could care less about the employment of firefighters and construction workers. It's an optimization problem.

DATA

Issue: Data quality can vary widely. How do you pick locations if the data is bad quality?

There are two types of quality issues. Production allocation is one example. It's impossible to accurately allocate lease level production to multiple oil wells. In this first case, we would not include multi-well oil leases (Texas and Louisiana) in the opportunity sequencer. While we never want to reduce our data size, garbage inputs = garbage outputs.

A second case is one-off bad data. For example, a mismarked formation that does not agree with the neighborhood. In these cases, it's worth looking at bad data. Data may be purposely obfuscated and hiding opportunities. Data may reveal an ineffective operator who made poor decisions. Or it may reveal that the data was just keyed incorrectly. Anomaly analysis is one of the opportunity algorithms.

Issue: The industry is buried in data/tools. Pull a permit and vendors are already hounding you.

These tools are very complicated to use and go through almost no user testing. If the founder of DI likes it, it goes to market. Forget usability. The end user will just need to invest dozens of hours to learn the software. Even DI executives (in presentations) get confused by all the tabs and can't find DI tools. And not all companies "drink the Kool-Aid," even if they are tool customers – they can be very frustrated with promises versus delivery.

This idea eliminates all the tools, data streams, user interfaces, etc. It provides the "output" of all these tools, with a lot of evidence written into the recommendations. It's what the end user would present to her/his boss after running these tools. And several have recommended we just buy all these tools and become super users.

Issue: There is nothing you can say that will make me jump up and down. Just tired of this data pitch.

We get that and totally agree. This was the precursor to Google. The precursor to Windows. Precursor to Excel. And these were all incredible technologies at the time. All this data talk is precursor. But to a person, we all believe data has a profound role in exploration. We just haven't seen it yet. IBM Watson -types are coming to exploration. No one disagrees. In fact, we hope to use Watson in this offering.

Issue: What about unstructured data?

Honestly, we think unstructured data will put us across the goal line. We are uniquely qualified to extract structure from these unstructured documents, so they can be used by algorithms. Much of the unstructured data has never been analyzed, at scale, by human or machine.

Issue: Isn't this just a 65,000-foot view of the data? Analysis that's not detailed enough?

A good metaphor is a web crawler like Google uses. We start in one corner of a state and attach to the first wellbore. All algorithms do their analysis on three levels: well only, well + neighbors, well + overall. Then we find the next closest well and repeat the process. It may take weeks to process a state, but it is done at a micro level using all available data.

Issue: If you had to pick one complaint about existing tools, what would it be?

Data retrieval limitations. To power such extravagant visualizations, tools must limit your area of interest. I want to look at one measure across an entire state. Sorry, too many rows. You will need to limit your search results to use our tool. To see our graphs. To load our maps. To export to Excel. This is a very big deal. Our solution does not have a row limitation.

Issue: Can Google do this? Some other huge tech company?

Google can do anything they set their mind to. But a huge limiting factor is usable data. 80% of any effort is cleaning and curating data (feature engineering) before software can analyze it. Google, Facebook, Twitter, etc. all must deal with bad data coming into their platforms.

There is another reason Google might pass. They code for the billions of users, the lowest common denominator. Large tech can't afford to standup such a specific and boutique offering. Too small an audience.

GEOLOGIST, GEOPHYSICIST & ENGINEERING (GG&E)

Issue: It feels like every acre is picked over. Are there real opportunities out there?

We are the hyena (scavenger) to the lion. Lions (large operators) will exit before a carcass is picked clean. We are not using data science to find new discoveries or large areas of untapped potential. We are using data science to evaluate and grade those who have come before us. Have they left meat on the bone? Did they make a simple mistake? Where they incented to bypass? Has the infrastructure changed? Etc.

Issue: This sounds like nothing more than professional services?

Consulting starts with a client ask, a client bias. I want you to restrict your engagement to my area of interest and here is the desired outcome. Consultants are incented not to disappoint clients. They want that next engagement. This black box has no biases and no incentives. The computer can't tell you what you want to hear. This goes a long way to establishing credibility. We tell it like it is.

Issue: Can this work in areas that have never been produced?

No. The algorithms need data and scale. If there is a large geography with no data capture, this process will not work. Each algorithm is about pattern matching. The computer needs to establish the good and bad patterns. The more data we have, the easier it will be to discern those patterns.

Issue: They really want someone who can work within a prescribed area of interest.

This is also professional services. Instead, our patterns find opportunities. These may or may not be within someone's area of interest/expertise. Therefore, we run the opportunity sequencer first and find the clients second. We can give an unbiased opinion on an area of interest, but this would pay rate per hour.

ALGORITHMS

Issue: I am concerned this is only the data science piece.

Agree. But we need to start somewhere. Let's say we did raise money to invest in a large GG&E team. We build the leads with technology and validate them with our own GG&E experts. We then take the term sheet to an operator. No matter what we present, operator will have their own GG&E team do the same analysis. It's better to partner to start. Over time, any revenues can be re-invested in technology that moves towards GG&E, like auto-blocking logs. Quantum will definitely help us break into GG&E.

Issue: Opportunity algorithms are interesting but have heard about them all before.

Agreed. Nothing special here. But as technologists, we have a few tricks up our sleeves. We can run these algorithms over 2MM+ wells (at scale) while we are sleeping. We can then build a second technology that aggregates all these algorithms into an opportunity sequencer. Then we can use technology to generate each term sheet and narrative. And at scale, we will get better pattern recognition. Ingredients are not as important as the chefs. Our value proposition is in how we combine the ingredients – the sequencer.

Issue: What do you mean by statistical probability?

Too many walk in and pitch a sure thing, best acreage that's ever been seen. We all know this is a crock. There is no sure thing. When we present term sheets, each section has a probability number attached and there is a probability number at the top of the overall term sheet.

We also use something called "inaccuracy probability" in all our algorithms. If done right, this inaccuracy stat can identify opportunities – obfuscation, poor operator performance, mistakes, etc.

Issue: I see the list of current opportunity algorithms. Can you explain one of them in more detail?

We never fret about sharing details on opportunity algorithms. Again, not that innovative. But the secret sauce is in the opportunity sequencer. That's the trade secret. Let's look at EUR as a basic example.

Everyone has a method for calculating EUR. All are wrong. Everyone knows this. Instead, we will take every single method of calculating EUR and compare them. Our algorithm will look at EUR prediction volatility. Is there consensus among the algorithms on EUR? Is there strong agreement? If yes, we can use that wellbore for aggregation and further analysis. If there is violent disagreement on EUR among the algorithms, we sideline the well from further analysis or discount its EUR predictions. This is only one piece of the EUR algorithm.

Issue: You talk about using industry-wide tools as part of this project. Is that allowable?

We are not reselling data. We are not allowing anyone to access the tool provider's interfaces. An operator buys IHS tools. These tools are used to draw conclusions and evaluate opportunities. We are doing the same thing. These terms sheets are far removed from the underlying tools and probably not even derivative offerings.

Of course, we will have our own tools and the sequencer. But we have heard that just becoming super users of existing tools may be enough for us to launch this idea. Be the buffer between tools and operator.

Issue: What's the difference between an opportunity algorithm and a sequencer algorithm?

We hope to start with 15-20 opportunity algorithms. Each give a go/no go answer on all drilling locations. A meta-analysis of all these go/no go decisions results in a grade. The grades allow us to sequence drilling opportunities from 1 to 2MM+.

A sequencer algorithm can change the rank, regardless of opportunity algorithms outputs. For example, we may have a high ranked location, but determined infrastructure needed will be too costly. Location will drop in rank.

Issue: How do you get a final list of algorithms?

We don't. We may start with 15 and quickly add 5 more. We may sunset 3-4 that are not contributing to the sequencer. We are open to every algorithm idea and have no pre-judgement on whether it will work. Let's try it and see how the algorithm performs.

There is one limiting factor. We are looking for algorithms that will run over the entire dataset. If it's specific to one state's data or a limited dataset, we will not be able to fully detect patterns, good and bad.

Issue: Are the same algorithms going to work across the entire United States?

Yes. Diversity is key to any algorithm's success. If an algorithm works in Texas, but not Colorado, it's immediately suspicious. Are we overfitting the data? Is the algorithm too simplistic? Is it biased? Algorithms that work across 2MM+ wellbores are must-have and an important part of our overall value proposition.

Issue: Prediction is hard. We see this in every industry. No one can predict the future.

This may seem counter-intuitive, but we are quite interested in prediction failure. We are interested in all data that does not fit a pattern. If a pattern shows outstanding production over a long time, every company will have figured this out by now and made their move. But if all signs are pointing to poor production and we see an anomalous high producer, we will want to know why there was a winner in a sea of losers.

SALES

Issue: If this idea is good, why not raise money and buy non-ops working interests?

Non-ops requires moving investor money into the market as fast as possible. There is a lot of pressure not to keep funds idle. This creates shortcuts and compromise. After, we watch returns. Are they coming in fast enough? Before more money is invested, we want to see results.

Pressure, expectations and stress run downhill. But they stop at the computer, where it's only bits and bytes. If we can remove human pressure from the sequencer, it will run and build the client volumes we need over time. It's an advantage for our clients. There is no outsider pressuring us. This is the purest form of unbiased technology.

Issue: Seems like selling data products and tools is much easier than selling drill locations.

Selling data products is more than price. IHS has a large share of the market, followed by DrillingInfo. IHS has an advantage in they have data no longer available from regulatory downloads. Therefore, it's very hard to compete against these two companies, regardless of how low you price your data. You must compete on data differentiation using more recent (regulatory) datasets.

The drill location is part of the same exploration value chain. Data products are used to determine ROI on potential locations. IHS sells the data, engineers analyze the data and the team decides where to drill. Instead of selling data, tools and user interfaces, we are taking the data through statistical analysis and delivering robust analysis (narratives) farther into the value chain.

Issue: Who's going to sell all these "term" (location recommendation) sheets?

Most of what we build as technologists flies right over the heads of sales and marketing people. Yes, they can do canned demos, but the prospective client is going to pepper them with hard questions and trip them up. Labor has been decoupled from corporate profits. Tech giants are doing more with less human infrastructure. Amazon Web Services does $20 billion in revenue and no phone number.

That's the goal of this idea. No sales team, no marketing, no support, no user interface, no logo, no website. It's sold as pure stealth. Confidentiality agreements are signed. There are no client referrals. No testimonials on a website. It's a small set of clients that get first look, evidence-based, term sheets. Only job of overall leader is presenting term sheets. And this leader will need deep industry knowledge. Can go toe-to-toe in any discussion.

Issue: Is there a fallback idea? What if this does not work or takes time to get going?

Each algorithm can generate a data product. This is "dogfooding." The analysis can be unbundled and sold as subscriptions, while keeping the sequencer private. Rate per hour work is also possible. Work with client to analyze his/her lease holdings. Render opinions on any area of interest.

In several calls, it's been recommended we team up with an existing GG&E consulting company. Expand beyond data science with an exclusive partner and share the upside. Or work directly with O&G prospecting companies.

CLIENTS

Issue: Who are the clients of this service?

2nd/3rd tier operators who don't have the money to invest in statistical analysis teams. They don't know (yet) how far the top tier is pulling away from them. They find the tools hard to use and the data overwhelming to handle internally. They need to spread the cost, among their peers, of world class analysis to have a chance against the top tier.

Private equity and smaller investment firms. They can't get a straight answer when investing. Sellers have all the engineers in their hip pockets. Back seller in this deal or risk losing future work. DI is already having some success, creating a NYC office, and selling to the major firms. Finance is increasingly attending O&G conferences.

Mineral rights buyers. This gets a strong reaction on phone calls. Love idea or hate it. Buyers are old school. Must wait too long for payout. Others say this may be the easiest entry point. They will listen to any/all ideas.

Issue: Risk/Reward tough to measure. What's this idea contributing to the overall wellbore?

As said above, this is about lead generation with a very small fractional ownership to start. Client takes all the risk and will work hard to verify and validate our leads. We would hope that if an operator validated one of our leads, we would become a trusted advisor and be invited to pitch more leads.

O&G regulations do allow us to measure the reward side pretty easily. If we present a lead and an operator passes, we can track permit and regulatory findings to see if that operator has developed the same acreage. We can also track production to check if we are being fairly compensated.

Issue: Are you dismissing large companies too soon? Why so 2nd/3rd tier focused?

The large companies have the best PhDs from School of Mines, Texas Tech, UT+, massive budgets and large internal datasets. I don't see any way to take them something they don't already know. Large companies may be interested in the sequencer just as a directional starting point. We are about to invest tons of money doing a deep statistical dive. What does this sequencer say before we get started? But, again, selling tools is not the primary idea.

Issue: Credibility is hard to obtain. Most have been over-pitched and are tired of empty promises.

Outputs of the statistical analysis are evidence-based with carefully curated "narratives" attached. Key location information is redacted. This is not a standard pitch. We are not dealing. We are not brokering. We sit on the same side of the table as our clients. Here is a drilling location "lead" and a statistical probability. Take it. Leave it. We are not pushing an agenda. We expect to hear no most of the time. The narrative is the sales process.

Issue: What about being the layer/go-between the complex tools and companies that need analysis?

This is rate-per-hour work with built-in incentives to tell the client what s/he wants to hear. Hack your way to confirming the client's desired outcomes. And each client will severely limit the scope and geography we will be able to analyze.

Issue: Aren't companies going to think this is just another O&G data tool?

All existing tools have a user interface. We won't. There is no visualizing data or exporting data. We provide a written-out business case for each geographic location. Final grade with empirical evidence.

When Google gives you search results, no one stops to think about Page Rank or the underlying web crawler or any algorithms used to generate results. User sees the very last step of millions of lines of code and decides if s/he likes the output. That's us.

Issue: Are client I.T. departments going to stand in the way of this idea?

All I.T. departments are a bit of a mess. One reason is technology ages so fast. We once heard that Marathon did an inventory of owned O&G applications and it came in around 2000. Data analysis is probably different from one cubicle to the next.

2nd/3rd tier operator I.T. departments will not need to be consulted. There is no data to load on servers. No tools to install. This is a zero-footprint product. Location presentations (term sheets) go straight to the CxOs.

ROYALTY

Issue: How are you going to bankroll this? Sounds like a massive investment is needed.

This is where the royalty comes into play. Non-ops working interest require large amounts of cash. Flipping leases is same way. Drilling wellbores, etc. All these stakeholders and more are our clients. We don't broker. We don't deal. We give good advice. We expect a very tiny piece of the action since we have no skin in the game.

If operators are incented to stay on the sidelines, there is no opportunity for us. Because of the incentive to keep drilling, we are just helping to direct an already strong incentive to drill baby, drill.

Issue: Operators already commission studies and hire smart consultants to do this work.

Yes, but we believe in smaller chunks. Looking at the entire Permian using consultants is a very large, time consuming, and expensive engagement. Pioneer and others are already doing these larger geographies with statistical analysis.

Issue: You talk about the offering being non-biased and highly objective. Is this going to work?

Maybe not. This is the weakest area of the entire idea. Finding opportunities and then clients is going to be a challenge. Clients, with their areas of interest and annual plans are going to want to bias the technology – to bend it to fit into their current game plan. "Objective" is not always going to play well with highly subjective clients.

MISCELLANEOUS

Issue: What makes you a genius. If it was a good idea, wouldn't everyone be doing it?

Large Wall Street firms and large operators are doing it every day. Only the largest can afford a full-time statistical analysis staff. This is just spreading the cost for world-class analysis across multiple smaller players. So, we are not creating anything revolutionary.

A second argument is to just be "super users" of tools already on the market. We don't need to recreate the wheel. Just become clients of data products providers and invest the time to learn each tool. The new idea here is bringing statistical (meta) analysis to a larger audience.

Issue: Is this a serious idea? Have you done your homework?

We started working in Oil & Gas data, back in 2014, with Baker Hughes. Smart people and intense data. But we were really surprised by the level of feedback coming from the engineers. We were getting some very basic questions about how to use technology. During this time, I started thinking about "biting off" more of the value chain and did a graphic on Hydrocarbon Candidate Selection. Try helping BHI more than just providing tools.

This led way to the "River Oaks Country Club" idea of ditching the business side altogether and supporting only a few, very selective clients. No sales, marketing, support, etc. More recently, I met with a Raisa Energy and one of the big Alpine High winners and the outcome was this value chain.

Issue: Seasoned engineers with institutional knowledge are retiring. Is next generation ready?

Yes. And this generation will do great things in the future. They were playing educational games on iPads before they could walk. Facebook and Twitter tell them what to read first. They use robo-advisors for stock picks.

Today's engineers expect more than raw data. Before they put eyes on it, they expect it to be fully analyzed and in presentation form. This is low hanging fruit and expected. They will take it to the finish line.

Issue: Aren't you going to need to hire a bunch of engineers to run all these commercial tools?

Nope. We will script on top of the user interfaces. The computer can emulate repetitive tasks an engineer does at the keyboard. Humans will never touch commercial tools. It will all be run with scripts while we are asleep.

Issue: Is there a roadmap for later releases of this tool?

The holy grail is an automated LAS log interpretation tool. We went as far as to get a quote from IHS for 300K digital logs ($87,497 for one year). We think the entire application can run off a PC and find wellbores that were not produced at the right depths.