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Communicating the Value in GeoScience – Quantify, Communicate, Improve

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Summary

Value in Geoscience - what is it? Ask any geoscientist and they will tell you that the work they do is highly valuable, and explain its value by telling you what they do and how they do it. They may talk about well logs, or seismic data or a mapping technique, but if you're not a geoscientist, the value message may not be evident. The reason for this is that the geoscientist is speaking a language you do not understand. The majority of workers in the oil and gas industry, including most decision makers, are not geoscientists. Because of this, geoscientists need more universal methods to effectively communicate value.

The term "manufacturing" has become fashionable in the oil and gas industry in recent years when applied to the operation of unconventional plays. The manufacturing business model is highly desirable because it allows for high levels of control of the product and/or service you are making/offering. While the manufacturing model can be used to streamline, automate, enhance or improve operations in oil and gas, fundamentally, the oil and gas industry is defined by uncertainty. We are at the mercy of commodity prices. Reservoirs are thousands of meters below the surface where we can't see, hear, or touch them. Organizations tend to focus on cost, as cost can usually be easily controlled. However, sensitivity analysis shows that cost most often has a smaller impact on economic outcomes than either commodity prices or production. Uncertainty in commodity prices can be mitigated through hedging strategies and/or integrated value chains, while production uncertainty is mitigated using geoscience information, reservoir engineering and optimized extraction methods. The value of geoscience therefore lies in its ability to maximize production and mitigate risks, which it does through thoughtful and rigorous subsurface interpretation. Geoscience is information and the value of that information is called VOI.

VOI is defined as the incremental increase in Expected Value as a result of incorporating additional information. VOI calculations evaluate a given business case using economic metrics, usually NPV, which is a universal means of communicating value with decision makers and non-geoscience colleagues. However, it is not always necessary to calculate VOI in order to understand the value of geoscience. There are many instances where the value of geoscience information is evident without a rigorous VOI calculation, such as a seismic map of a pinnacle reef, for example. However, in unconventional plays or under-resolved reservoirs, seismic and/or geologic maps can have a high degree of uncertainty that can wreak havoc with finely-tuned economic and development models.

Quantifying the uncertainty in geoscience mapping captures the range of expected results that can occur, so when drilling results don't perfectly match nominal predictions, the geoscientist's interpretation isn't immediately invalidated. Understanding this uncertainty in geoscientific deliverables speaks volumes to decision makers and non-geoscience team members because we are speaking a common language – statistics. It doesn't matter what fancy seismic attribute was mapped or what well cutoffs were used. Statistics speak to the ability of the interpretation to predict the reservoir parameter of interest, which is what our engineers and decision makers are interested in and that value is understood.

Once a subsurface interpretation is quantified and the range of uncertainty understood, another benefit becomes apparent. We can now ask ourselves the question “are we happy with this range of uncertainty?”. If the answer is yes, business as usual, everyone understands both the upside and downside. Alternatively, if the answer is no, we can look for ways to minimise downside, or risk. This makes a great business care for the seismic reprocessing you would like to have done, or the appraisal well that you feel needs to be drilled, or the rock physics project you would like to tackle. In the famous words of Peter Drucker, “if you’re not measuring it, you can’t improve it.”

Theory and/or Method

Basic statistics are used to quantify and express uncertainty in geophysical predictions. Methods include basic cross plotting, linear regression, non-linear regression, multi-variate regression, percentile calculations using prediction intervals, statistical significance, t-tests and cross-validation. Results are presented using basic graphs and charts in order to effectively communicate findings to decision makers and colleagues.

VOI is calculated using decision tree analysis. Once branch of the tree will contain decisions and probabilities of events occurring without the use of geoscience information and the other branch will contain the same economic calculations but using the additional geoscience information. The difference in value between the branches of the tree is the VOI.

Examples

1. Basal Quartz probabilistic net sand predictions and VOI calculation – do we need to drill a strat well?
2. Ellerslie probability mapping - it is that simple to create lightbulb moments!
3. Error analysis of Glauconitic depth conversions? Are we still comfortable with the error associated with the depth conversion compared to when we started drilling the play?
4. A look back study: Glauconitic EUR prediction using multi-variate analysis – would an integrated and quantitative approach have helped us reduce risk what would have been the value?

Conclusions

The value of GeoScience in the oil and gas industry lies in its ability to provide information that can help to maximise production and mitigate risks. The degree to which it is useful is sometimes debated or poorly understood. In order to overcome this, we only need communicate it better to have decision makers and organizations see its value. The only way to communicate is by speaking the same language. Simple and accessible ways of doing this are through probabilistically quantifying interpretations using statistics, communicating with simple charts, graphs and quantitative maps, and improving interpretations as necessary and where possible.

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