BIAS

#17 Alternate Scenarios

Two of the best ways to mitigate biases is to consider alternate scenarios and multiple working hypotheses; yet technical teams often overlook these important processes. Why?

***THE NORMAL EXCUSE***

Interpreters often suggest lack of time and limited resources for why they do not consider alternative models. Certainly, one unfortunate aspect of the exploration process is that the technical work always gets squeezed for time. For example, seismic data needs to be acquired, commercial arrangements made, and management needs to make decisions, all of which delays interpretation. It is tough to work on the technical evaluation when you are waiting for necessary data. But does that preclude considering other models? Although there is some merit to this justification, it's still an excuse, masking a much deeper flaw. Could it be that our cognitive biases impede our ability to consider alternate scenarios? Let's explore.

***MULTIPLE WORKING HYPOTHESES***

When we consider alternate scenarios and models, we examine multiple working hypotheses; in other words, proposed explanations for a phenomenon we wish to study. A geologist, Thomas Chamberlin, first described the concept of multiple working hypotheses (Chamberlin, 1890).

Many of these hypotheses will be contradictory, so that some, if not all, will prove to be false. However, the development of multiple hypotheses prior to the research lets us avoid the trap of focusing on just one model and ensures we keep an open mind to the actual possibilities. It is important to realise that a phenomenon can be the result of several causes, and data and observations can support the feasibility of more than one model.

***COGNITIVE BIAS REFRESHER***

Let's step back and remind ourselves of the definitions of the Cognitive Biases we have discussed in this blog series; please check out the links below to each bias reviewed:

- Ambiguity – see *Blog Article #14*
- Anchoring - see *Blog Article #10*
- Availability - see *Bias Blog Article #2*
- Confirmation - see *Bias Blog Article #6*
- Framing – see *Bias Blog Article #13*
- Illusion of Knowledge – see *Bias Blog #8*
- Illusion of Objectivity – see *Bias Blog Article #8*
- Illusion of Potential - see *Bias Blog Article #8*
- Information - see *Bias Blog Articles #3* *and* *#4*
- Planning Fallacy – see *Bias Blog Article #15*
- Overconfidence - see *Bias Blog Article #12*

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- Motivational - see *Bias Blog Article #7*

***BIASES INFLUENCE OUR BEHAVIOURS***

Each bias covered in this series can adversely affect our interpretations, assessments, judgments, and decisions. They can also influence our behaviours, creating pitfalls that make it challenging to consider alternate scenarios and multiple working hypotheses.

- Illusion of Knowledge & Potential, and Overconfidence – leads us to believe we understand the model and fully incorporated all the data.
- Illusion of Objectivity – believe that we have objectively considered all possibilities.
- Anchoring – we are attached to one scenario or analogue.
- Ambiguity, Availability, Confirmation, and Information – can lead to us incorrectly assessing the impact of (i.e., overweight) new information on our model.
- Framing – an inclination to favourably present our preferred model.
- Motivational – we have a personal investment in developing the model.

These biases can enhance our tendency to incorporate our prior experiences as we interpret data, in turn making our models look more positive and probable. This then leads us to strongly favour a preferred model and reject others. We then may find ourselves in a vicious cycle where continued work and analysis further strengthens our belief in our model, making us overconfident that it is the correct one. This will in turn effect our judgments and decisions of the way forward.

Certainly we will want to mitigate the influence of each of these biases, which we go into great detail in the Mitigating Bias, Blindness and Illusion in E&P Decision Making course. To compliment these mitigations, you might consider implementing the following work strategy.

***PROPOSED WORKFLOW TO CONSIDER ALTERNATIVE SCENARIOS***

The five-step workflow can help ensure alternate scenarios are considered and evaluated: Range – Likelihood – Revise – Remove – Progress.

1) **Identify the <u>full range</u> of possible subsurface models that are supported by the data and interpretation and avoid arbitrarily dismissing any model.**
   - There may be a favoured model, perhaps one that was developed at the initial evaluation stage (this is known as a working hypothesis). Rather than only focusing on this model, teams should highlight other models that are viable and supported by the current data and knowledge. You will want to highlight all the assumptions and justifications for each scenario. Documentation of this step is critical, as it is often difficult to simultaneously keep track of multiple concepts. A Framing Session is a great way to address this step of the workflow (*please feel free to contact me for further information on how to hold a Framing Session)*. Partners are also an excellent source of alternative interpretations and models as their work will be independent of yours.

2) **Consider the <u>likelihood</u> of each scenario given your current data and understanding.**
   - You will now want a better insight into which scenarios are more likely given the data and will need to assign a probability of success to each. As we are much better at relative judgments rather than absolute, this will help you to make comparative judgments between the different scenarios and determine relative weightings on the likelihood of each. For each model, as you do with estimating a prospect chance of success, look at each component independently rather than taking a holistic view of the model. You will want to outline further work and data

required to progress your understanding of each model. Biases can make this step more challenging, so consider not only why a model may work but also why it may not.

3) **Given new data or information, revise the likelihood of each previously considered scenario.**
   - New data or information should help you to further understand the viability of the models. Discussing with other individuals, particularly with diverse experience, often makes a better analysis. Another Framing Session or Peer Review may be appropriate for this step.

4) **Remove any scenarios that are internally inconsistent, have clearly flawed assumptions, or low likelihood given the new evidence.**
   - Carefully consider your decision to remove any scenarios from further analysis. Whilst you need to reduce the number of models you will be working on given your time constraints, do not lightly dismiss any scenario. For example, there may be an erroneous tendency to remove a scenario that suggests limited potential (a common manifestation of the *illusion of potential* or *overconfidence* biases). This step is perhaps where team creativity will be at its peak. You should ensure documentation of your work, noting all the models you have considered and why, and your justifications for not moving forward with the models you rejected.

5) **Progress the remaining scenarios that are now most probable.**
   - By this step you will evaluate the remaining two or three scenarios. This is where you will outline the appropriate work programme to rigorously evaluate the model and the risk and uncertainty of each hypothesis and specific geologic elements (i.e., reservoir, source, and trap). Your further work and data should then help you focus on the most likely scenario/s. Many commercial prospect resource assessment software modules, such as ProjectRA, now permit probability weighted aggregation of models and can solve each model independently.

*Reference Cited*

Chamberlin, T.C., 1890, The method of multiple working hypotheses: *Science*, v. 15, p. 92-96.

A special thanks to Henry Pettingill of Rose & Associates who provided suggestions to the proposed workflow.

***UNTIL NEXT TIME***

The next article in the series will explore an aspect of the *information* bias known as the *conjunction fallacy* and how this heuristic may contribute to people believing in conspiracy theories!

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Stay safe and healthy.

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