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Judgment Elicitation Process for Multi-Criteria Decision-Making in Oil and Gas Industry

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Abstract

Decision-making related to oil and gas exploration and production relies on objective data analysis as well on subjective judgment of experts. Expert judgment often considered to be less and accurate than objective data analysis. Nevertheless it is still one of the most common ways in which decisions are made in the petroleum company. By improving judgment elicitation process particularly in the case of multi-criteria decision-making, it is possible to improve quality of critical decisions. Different technique can be used to elicit judgment from individual experts and group of experts. A judgment elicitation workflow includes interviewing of experts, comparing subjective expert judgment with results of objective data analysis for example related to geological uncertainty, performing reality checks, making a decision, and reviewing and evaluation of the judgments. Proper use of judgment elicitation techniques together with objective data analysis will lead to significantly better decisions related to oil and gas exploration and production.

Introduction

Uncertainty assessment in the petroleum industry can be performed based objective information, such as using analogs or actual production data, as well as by interviewing experts [1,2,3]. Traditionally expert judgment considered to be less accurate than objective data analysis due to inherited biases. However recent research shows that subjective expert judgment can be accurate as long as it is properly elicited [4,5,6]. In other words the experts need to be asked proper questions in a proper order. The judgment elicitation process should be properly designed for the particular problem.

There are two types of biases: cognitive and motivational. Cognitive biases show up in the way we process information. In other words, they are distortions in the way we perceive reality. There are many forms of cognitive bias, but they can be separated into a few groups:

1. Behavioral biases influence how we form our beliefs. An example is the illusion of controlling something that we cannot influence. Another example is our tendency to seek information even when it cannot affect the project.
2. Perceptual biases can skew the ways we see reality and analyze information. An example of one of the more common perceptual biases is overconfidence. Many project failures originate in our tendency to be more certain than we should be that a certain outcome will be achieved.
3. Probability and belief biases are related to how we judge the likelihood that something will happen. This set of biases can especially affect cost and price estimates.
4. Social biases are related to how our socialization affects our judgment. It is impossible to find anyone who manages an oil and gas exploration and production project in complete isolation.
5. Memory biases influence how we remember and recall certain information. An example is hindsight bias (“I knew it all along”), which can affect judgment elicitation.

Motivational biases are caused by the personal interests of a person expressing an opinion. They are often easy to identify but difficult to correct, as you must remove the motivational factors causing the bias. If an opinion comes from an independent expert, removing the bias will not be too difficult because, by definition, an independent expert does not have any vested