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Creating Better Cost Estimates for Floating Offshore Structures by Assessing Cost Correlation and Understanding Risk

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ABSTRACT

At the early stages of the project lifecycle, offshore engineers can use parametric cost estimates, which rely on cost correlation. However, making decisions based on a parametric cost estimate may increase the uncertainty of completing a project within the target budget.
Within the industry, estimating development costs for floating offshore structures is often considered a complex and multi faceted task because the cost components are variable due to uncertainties while the overall development cost becomes increasingly probabilistic as a result of the correlation of these cost components. This paper focuses on the author's ongoing research into methods of estimating the cost, uncertainties and risk of floating structures and attempts to answer the question: How do you know the real cost of floating offshore structures in the concept selection phase? The emphasis is on a cost correlation and cost estimate validation process, which provides a means of identifying and assessing risks in the conceptual and front-end phases of the project because the key to accurate estimating of offshore construction cost is focusing on potential risks and opportunities. The process involves a qualitative assessment of uncertainty in each cost component. This uncertainty is transferred to a cost factor distribution such that the uncertainty effects of each factor are integrated into the overall development cost. It is expected that the methods presented in this paper will improve front-end engineering while increasing the level of confidence in engineered costs for floating offshore structures.

KEY WORDS: Floating Offshore Structures; Cost Estimating Relationships; Risk; Uncertainty; Cost Correlation; Fuzzy Logic; Artificial Neural Networks.

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INTRODUCTION

Cost estimation for floating offshore structures usually results in a single cost estimate based on historical information or data. However, recent data from completed projects have revealed a large variability between early cost estimates and actual costs. The causes of the observed variability were due to risks associated with the basis and assumptions of the cost estimate. This risk is a result of the large amount of uncertainties in the scope and definition of floating structures at the conceptual phase. This is substantiated by Evans and Olson (2002), who state that risk is related to the uncertainty associated with things outside one's control, and the results of this uncertainty.
According to Clark and Lorenzoni (1997), the two factors that affect the accuracy (variability/uncertainty) of estimates is the reliability of the basis of prediction and reliability of the estimating method, data and tools used. However, for floating offshore structures cost estimating, data and basis of estimate are normally of utmost concern in the early project phases of an offshore construction project. This is complemented by the estimating method and accuracy, which are very important.
The use of parametric cost estimating method based on cost correlations which provide the appropriate level of accuracy ensure that the variability is somewhat reduced when fuzzy logic and artificial neural networks are applied to the parametric estimates during the predictive modeling.

ESTIMATING THE COST OF FLOATING OFFSHORE STRUCTURES

Floating structures considered in this research include Floating Production Storage and Offloading Systems (FPSO) as well as all other configurations of floating structures used in offshore oil and gas production such as the ship based Floating Storage/Production Units (FSU or FPU), Floating Storage and Offloading Units (FSO), or tethered Tension Leg Platforms (TLP), Semi-submersible units and Spars.
Parametric Cost Estimating (PCE) describes a number of cost correlation analyses involving cost analysis, cost estimating relationship development, risk analysis, etc. A main objective of the PCE in this paper is to determine the total cost of development of offshore structures based on cost correlations. The predicted PCE is useful information for validation of the base cost estimate. It also facilitates decision making while selecting between offshore development options by identification of cost drivers for optimization during design, in scheduling maintenance, or in planning revamps.

A number of procedures for PCE exist and the procedures do not differ. Any little differences observed are due to differences in the systems for which cost is being estimated. Not withstanding, there are some shared processes, which are common and essential in all of the PCE