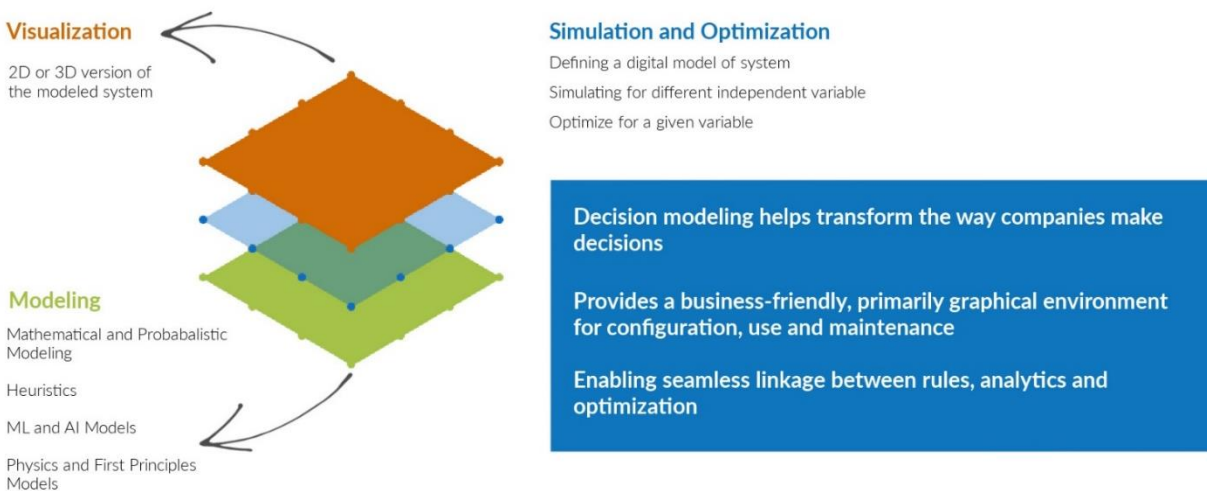# DECISION MODELING – PERSPECTIVES AND USE CASES

What is Decision Modeling?

Corporate decisions with deep and long-range implications fall into a special class of problem-solving. These are often complex with many degrees of freedom and a large solution space. Consider that just seating 13 guests around a dinner table has 6.2 Billion possible combinations and you begin to get a sense that human intuition alone is insufficient for highly complex business decisions with substantial economic consequences. To that end we must combine intuition, judgment, experience, and knowledge with data, models, and computation. The term Decision Modeling captures this concept well. The spectrum of complexity of Decision Models depends on the complexity of the underlying problem that is being addressed.

Business decision modeling and management is both and approach and a technology approach and a technology stack for automating and improving business decisions.

Visualization
2D or 3D version of the modeled system

Simulation and Optimization
Defining a digital model of system
Simulating for different independent variable
Optimize for a given variable

Modeling
Mathematical and Probabalistic Modeling
Heuristics
ML and AI Models
Physics and First Principles Models

Decision modeling helps transform the way companies make decisions

Provides a business-friendly, primarily graphical environment for configuration, use and maintenance

Enabling seamless linkage between rules, analytics and optimization

With the current situation in oil and gas, decision models can be used to build inherent flexibility in the **producing assets,** from production optimization to decide which wells have to be shut-in or producing based on market demands, storage capacity, capex availability, maintenance costs etc. **to decommissioning**; to understand the sequencing of abandonment and decommissioning. An optimization model can analyze all the different possibilities and suggest optimal solutions. This results in plans that specify the sequence of operations on wells that should be performed by which vessels or rigs, while complying to restrictions and constraints. Moreover, the optimization approach allows for scenario analyses, that can help evaluate different strategies and affect decisions and the impact on total cost.

The Components of Decision Modeling

Decision Modeling follows a proven process that is reflective of the Scientific Method.

Qualitative Model

The first step in the process is the creation of a hypothesis. The hypothesis becomes a platform for the creation of a qualitative model.
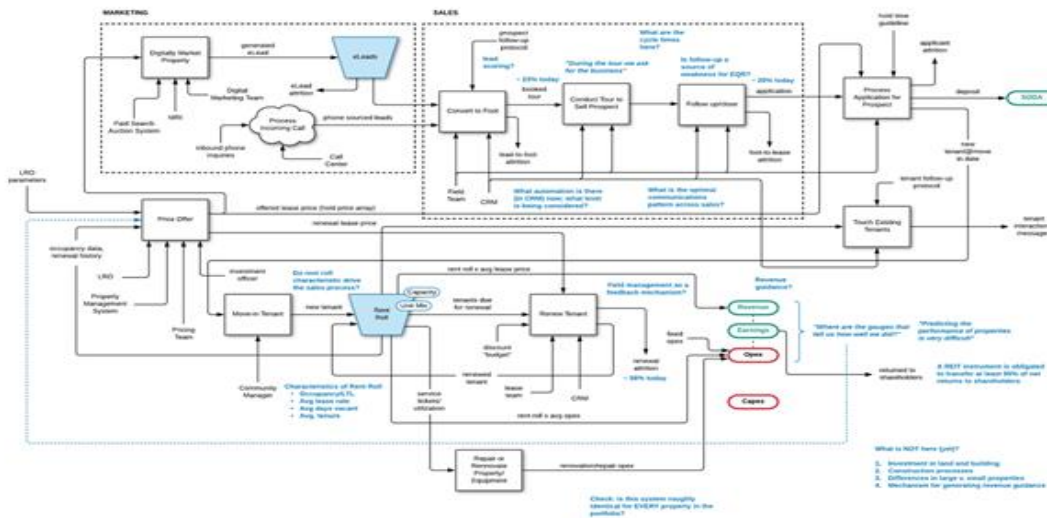
The qualitative model creates a plan for the kinds of data needed by the model. In this step two things happen: 1) a normalized data model (graphic) is created, and 2) the data is acquired or requested from the client.

Quantitative Model

The qualitative model is the blueprint for a *quantitative* model and is built using the logic and from the qualitative model and simulated using client data with varying modelling methodologies and technologies. The KPI's that are identified by the client can be simulated through this model. Client can interface with the model to run different scenarios that maps to real world situation. As e.g., clients can simulate well sequencing for different outcomes such as safety, production, or reduced capex. Each of these simulations maps to a decision that can be made—the model's calculated KPIs then show the implications of these decisions.

Models can be built iteratively to deliver value and becomes a basis of delivering a digital twin of a business that can be updated to evolve with changing situations.
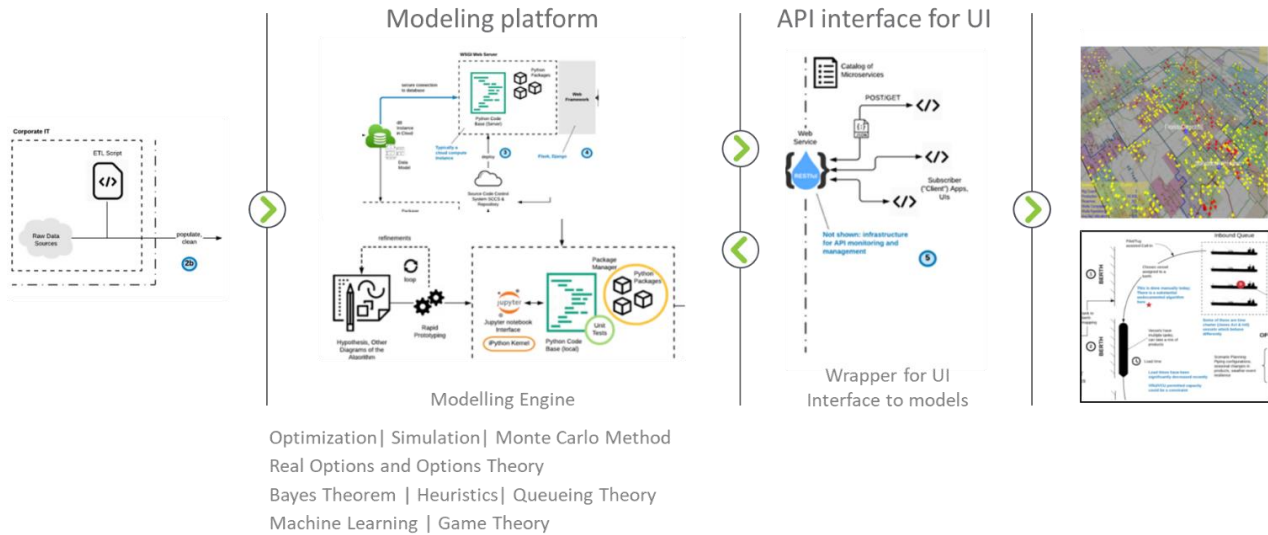
Visualization

Visualization form an important interface for clients to interface with the model. Intuitive visualization helps users interact with the underlying model and helps get that buy-in. In many cases, models and its visualization bring the underlying data and its story to life that can help users make better decisions.

The Technology of Decision Modeling

A host of technologies that can be brought to bear on Decision Models. Here is a *small* sample of the kinds of technologies and methodologies that are used.

Modeling platform

API interface for UI

Modelling Engine

Wrapper for UI
Interface to models

Optimization| Simulation| Monte Carlo Method
Real Options and Options Theory
Bayes Theorem | Heuristics| Queueing Theory
Machine Learning | Game Theory

Use Cases

Calculating the optimal sequence for drilling a series of wells

SITUATION

Client was manually sequencing a program of 1400 wells in the San Juan
Client wanted to be able to test different objective functions around Safety, costs and steady oil production growth

RESULTS

Better understanding of the impact of different well sequences on key metrics
New tool and process in place to optimize well sequencing and the ability to update quickly with new information
Improved well sequence

SITUATION

Well sequencing to drilling optimization and logistics

RESULTS

Customers have leveraged process and technology to deliver value on capex and opex while allowing their employees to make the right decisions at the right time
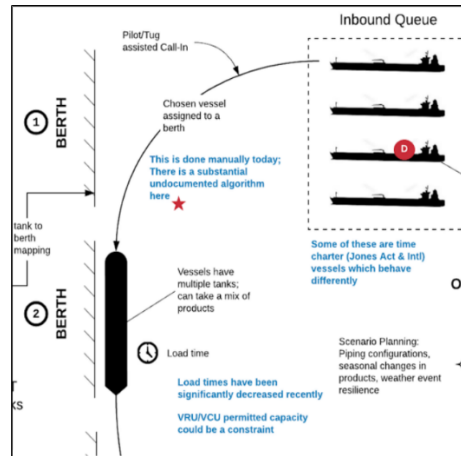

SITUATION

Client evaluating the impact of a +$10 billion investment on its export terminal
Developed discrete event simulation model to test various scenarios and asset configurations

RESULTS

Static Excel model missed several key
Storage tanks for several products under sized
Severe congestion at one berth impacting plant run time

Value

Rapid

Decision modeling can be faster than traditional approaches due to its faster adoption

Engaging

Business SMEs participate more fully in decision modeling because they get to embed their knowledge and can get clarity on the requirements for data and logic in a decision. Some client training departments are now using the decision model to train people.

Open

Human and automated decisions can be modeled together so you can use decision modeling when dealing with any kind of data and any kind of decision. That makes it easy to adopt as part of your standard approach.

Collaborative

Users can express the business problem and share using their model, making it easy to get agreement and discussion about reuse and common/shared decision-making, before implementation reducing barriers to adoption.

We would welcome the opportunity to understand how Decision modeling and our methodology can help you make better decisions in the current environment. Please contact us and we can share our insights and go through our models.

Contact Information

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