



Decision making is difficult and it becomes more difficult when groups of people are involved

Quality Decision Making contains three key components: framing the problem or opportunity, incorporating uncertainty when evaluating choices which demand it, and communicating with stakeholders.

INTRODUCTION

Decision Frameworks philosophy is anchored in several guiding tenets derived from the ancient Chinese proverb, "Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime".

Decision making is difficult and it becomes more difficult when groups of people are involved. Many companies have taken a team approach to projects and decisions and this can be compounded when partners or alliances are involved. The decisions are becoming more complex, the investments more significant and the cost of making a poor decision more damaging.

In businesses where risk and uncertainty are routine, the case for change has been demonstrated. When companies use a proven decision process, they shorten the decision making timeframe, they hold more informed discussions with their executives, they retain more knowledge and they execute more well-run projects. In short, on average, they make better decisions and get better results. This proven process, referred to as Quality Decision Making (QDM), is summed up in our tenets.

OUR TENETS

It's not just about the numbers

Quality Decision Making contains three key components: framing the problem or opportunity, incorporating uncertainty when evaluating choices which demand it, and communicating with stakeholders. Believing that uncertainty analysis alone will insure better performance is a common flaw in many implementations targeted to improve decision making.

Pass the baton

To enable a decision revolution in a capital intensive industry filled with risks and uncertainty, the fundamental elements of decision analysis must leave the hands of consultants, both internal and external, and the "baton" must pass to internal project teams. Change will not occur through traditional consulting relationships but through the democratization of decision expertise and tools. The internal project team must frame the problem, evaluate the choices, incorporate risk and uncertainty into the analysis when necessary, and dialogue with the decision makers to guide the decision process appropriately.



The decisions are becoming more complex, the investments more significant and the cost of making a poor decision more damaging.

Provide a lifetime prescriptive approach to help the process develop roots and grow.

OUR TENETS (CONTINUED)

Jump start the teams

Make decision-making easy through easy-to-use tools and templates that address the entire workflow, from framing through analysis. Provide a tool set that makes it easy to guide and enable all the elements of decision analysis, including industry templates and case studies, to simplify the process, provide more rapid results and improve knowledge retention.

Prescription for a lifetime

Provide a lifetime prescriptive approach to help the process develop roots and grow. Set decision-making targets, monitor and measure improvements, evaluate frequently, and establish new targets.

Make it real

Work real problems – the customer's problems – in real time. Keep the context of any training and skill development real and pertinent. Demonstrate that Quality Decision Making can be timely, easy and relevant to today's decision problems.

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DTrio®

BRING CLARITY TO THE DECISIONS YOU FACE EFFICIENTLY AND EASILY WITH THE DTrio DECISION FRAMING TOOL

"It isn't that they can't see the solution. It is that they can't see the problem."
GK Chesterton, 1874-1936

It is human nature to encounter a problem and jump to a solution. That is how we make the many problems we encounter manageable. It even seems efficient. Unfortunately, many inefficiencies are born from our tendency to jump to the answer before standing back and asking ourselves, "what problem are we trying to solve and what questions do we need to answer before we can choose a solution?" That is what decision framing is all about – posing the right questions, either individually, or with a group, and structuring any necessary evaluation of alternatives to address those questions.

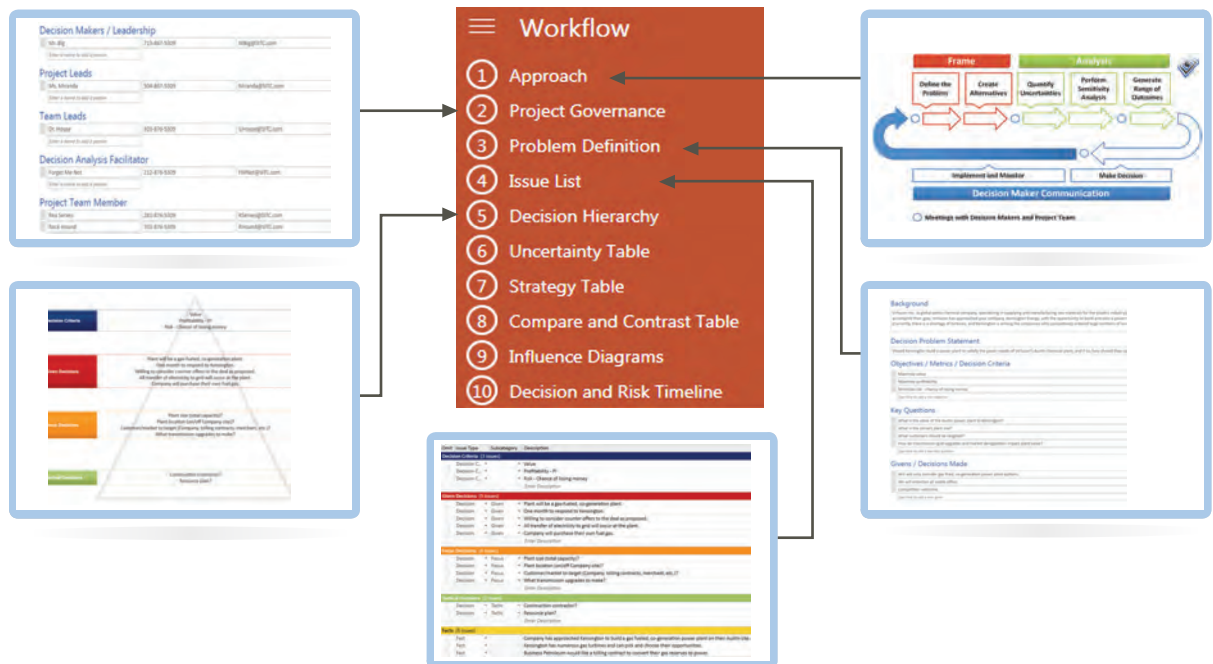


System Requirements

DTrio is built in
Microsoft .Net® Framework 4
Works on any Windows 7+
desktop OS

STATE OF THE ART DECISION FRAMING SOFTWARE

DTrio is designed to help democratize the art of Decision Framing and put Decision Quality into the hands of an organization. Gone is the requirement for whiteboards and flip charts, ad hoc spreadsheets and slide templates. DTrio helps individuals or teams quickly structure their thoughts to solve problems, by guiding them through the simple steps to frame their decisions.



Key features:

- Step by step Decision Framing toolkit
- User definable Decision Framing templates and workflow
- Prompts for clear decision problems/opportunity statements, objectives, key questions and givens
- Integrated Project Governance and team contact information
- Sorting, categorizing & grouping of issues
- Automatic creation of the Decision Hierarchy
- Drag and drop Strategy Tables, Uncertainty Tables and Influence Diagrams from sorted issues
- Flexible Strategy, Scenario, and Qualitative Assessment Tables
- Insightful, presentation ready Compare & Contrast modes for strategies and scenarios
- High level Decision & Risk Timelines

KEY BENEFITS FOR THOSE NEW TO DECISION FRAMING

- Great for individual framing of problems in preparation for team or management conversations
- Uses the principal elements of Decision Analysis/Decision Quality framing
- Available templates guide new framers through the steps they find most helpful
- Adjustable workflow provides flexibility to address any size decision problem and change steps as needed
- Guides and structures group conversations, creating a work product from team meetings
- Enhances communication and project management via built-in team emailing, sharing of files and decision record keeping
- Clarifies project governance (decision makers, team, subject matter experts)

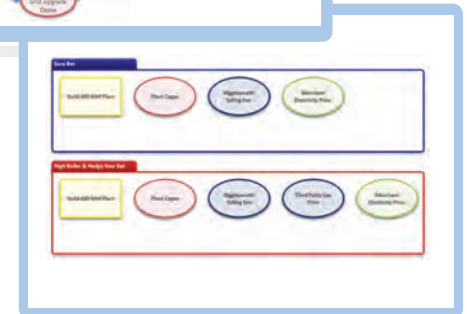
Strategy Name	Objective	Rationale	Target Market / Customers	Plant Capacity (MW)	Transmission Grid Upgrades	Plant Location
Sure Bet	Capture secure commitments	Low risk; ability to expand; avoid expensive grid	Virtucon Chemical Plant	100	None	Rent Virtucon Site
High Roller	Capture merchant market at low cost	Test value of merchant markets w/o grid upgrades	Bigglesworth Tolling	300	Required	Rent Nearby Property
Hedge Your Bet	Avoid risk of grid curtailments	Test value of merchant markets with grid upgrades	Merchant	400	Required & Optional	Purchase Nearby Property
Bare Bones	Capture secure commitment and preserve capital for	Lowest risk: test value of least cost investment	Merchant Surplus Power	500		
				600		

Strategy Table

KEY BENEFITS FOR DECISION FRAMING EXPERTS

- Purpose-built Decision framing application designed to save experts time
- Great display graphics turns team brainstorming into team "Framestorming" sessions
- Project DTrio on a large screen and work with teams in real time, reducing time-consuming post session clean-up associated with whiteboards and flip charts
- Supports copy/paste
- Categorize issues once, reuse issues throughout the frame without retyping
- Drag and drop issue sorting and grouping
- Strategy tables can be reformed into Qualitative Assessment, Scenario, Pro/Cons and SWOT tables, plus many other useful thinking tools
- Exports tables in a Microsoft Excel® format
- Simplifies post workshop reports through built in spell checking and versatile screen capturing of all elements of the frame
- Stores frames for future review and updating

Influence Diagram



Decision and Risk Timeline

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TREETOP®

DECISION SOFTWARE FOR THE NEXT GENERATION

THE CHALLENGES OF MODERN DECISION MAKING

Today's decision-makers have never been more challenged; as the speed of business accelerates, ramifications of poor choices can be catastrophic. How then, can decision makers improve the quality of their decisions, mitigate their risk and be confident in the outcome? Through a structured work flow called "Decision Quality" that can be learned and applied to all manner of decision problems, and critical to its use is the incorporation of decision tree and uncertainty analysis. Key to this solution is coupling it with TreeTop, Decision Frameworks' innovative software application.

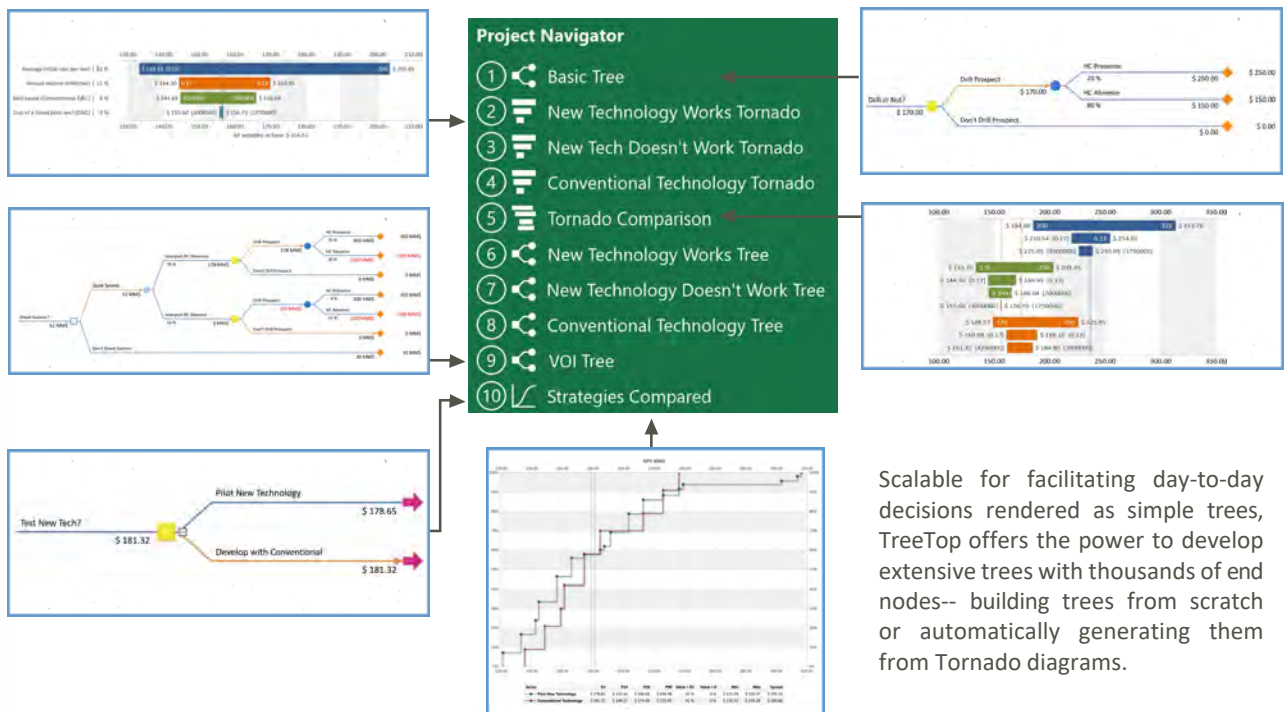
The TreeTop application delivers a state of the art graphical interface with a powerful calculation control system and the capability to manage external models, such as those built in Microsoft Excel and other commercial systems.

TreeTop is an innovative decision software, unlike typical variations of existing decision tree technology, designed to take advantage of next-generation advancements and incorporate Microsoft Excel as an add-in.



System Requirements

Microsoft Windows® and Excel® required



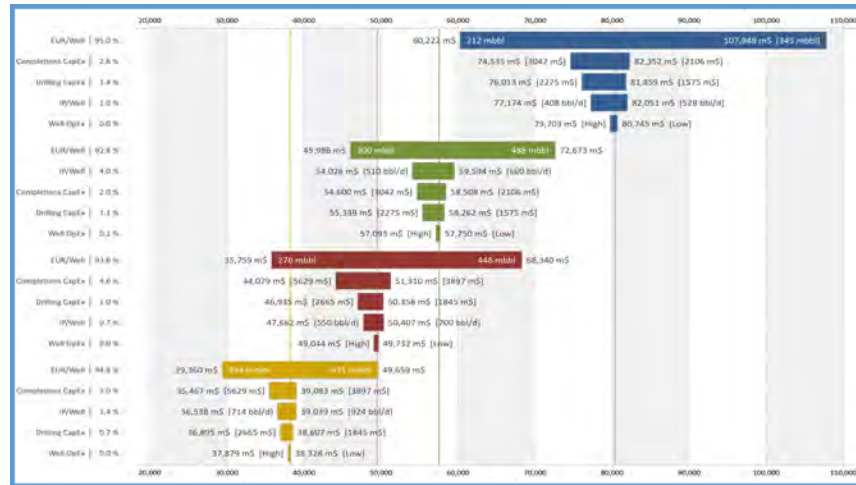
Scalable for facilitating day-to-day decisions rendered as simple trees, TreeTop offers the power to develop extensive trees with thousands of end nodes-- building trees from scratch or automatically generating them from Tornado diagrams.

KEY FEATURES

- Create Tornado diagrams whilst honoring dependencies between variables
- Automatic decision tree generation from Tornado diagrams
- Rapid tree development with easy visualization of complex trees
- Embed logic nodes and/or Excel VBA® macros anywhere in the tree structure
- Automatically show how optimal decision paths change with evaluation metrics
- Compress large trees through the auto link feature for clear visualization
- Customize evaluation metrics
- Properly handle recalculated evaluation metrics (e.g. IRR, ROR, etc.)
- Instantaneous re-calculation of only changed parts of the tree
- Link trees on multiple tabs
- Screen capture each phase of the work flow

KEY FEATURES CONTINUED

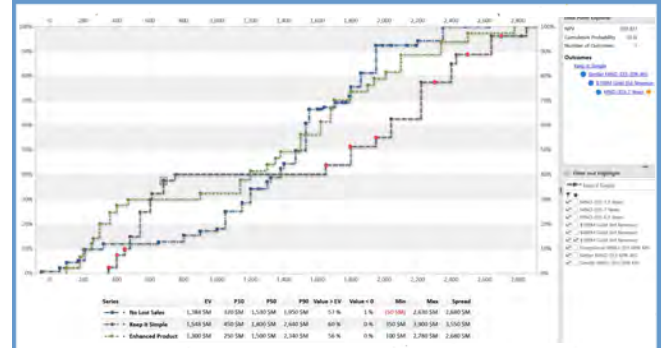
- Game Theory support in trees
- Value of Information Wizard and support for Bayes Theorem
- Build Range of Value Curves from any node in the tree
- Compare Range of Value Curves across a variety of evaluation metrics
- Filter and highlight Range of Value curve points to visualize the impact of variable influence on metrics
- Enterprise Edition links to additional economic engines (in addition to Excel)



Evaluate uncertainties through Tornado comparisons

KEY BENEFITS FOR DECISION ANALYST

- Get up to speed immediately as a beginner with the easy to use interface
- Explore the high-end feature set as an advanced user
- Save time by using existing deterministic spreadsheets for probabilistic analysis
- Understand quickly which uncertainties are driving and destroying project value
- Discover hybrid solutions by mining for insights across the curve of value
- Improve your competitive position using Game Theory
- Communicate clearly with presentation-ready visuals
- Recognize the impact and value that information can have on your choices through powerful Value of Information analysis



Filter and highlight curves to simplify interpretation

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Decision Frameworks is a Microsoft ISV program partner.



Use of logic nodes to facilitate game theory and partner negotiation

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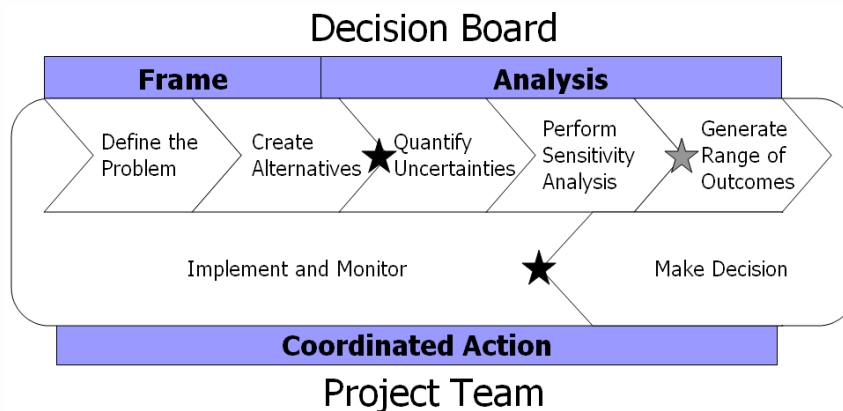
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PROJECT JUMPSTART WORKSHOPS

JUMPSTART THE ANALYSIS OF YOUR COMPLEX DECISION PROBLEMS

Complex decision problems, such as concept selection, exploration strategy, and enhanced oil recovery projects, can take significant time to evaluate and plan for, even with a structured decision process. However, this cycle time can be reduced via the Decision Frameworks Project Jumpstart Workshops.

How are these different from other workshops? A Decision Frameworks Jumpstart Workshop expedites complex decision evaluations while imparting skill to the organization via a unique combination of training, software, and project organization.



★ Meetings with Decision-Makers & Project Team

Teams and Management work through a common decision making approach

Accomplish Skill and Project Goals

At the end of a Project Jumpstart Workshop, your project's teams will have:

- Agreed on the initial frame (evaluation set-up).
- Assessed initial uncertainties via documented, expert interviews.
- Evaluated initial strategies, incorporating uncertainty.
- Reviewed initial insights, remaining work, and schedule.



- **Make well-informed decisions on complex problems more quickly.**
- **Develop decision analysis skills in project teams and managers while working relevant decisions.**
- **Train your economists to model uncertainty into their evaluations of complex decision problems.**
- **Develop championship within the organization for structured decision making.**

From the skill development perspective:

- Managers will have:
 - Provided feedback for the development of a decision frame.
 - Mined for insight from uncertainty analysis.
- Project team members will have:
 - Participated in the decision analysis of a project.
 - Characterized project uncertainties via documented expert interviews.
 - Mined for insight from uncertainty analysis.
 - Had a dialogue with decision-makers regarding frame and analysis.
- Economists supporting the analysis will have:
 - Developed a practical uncertainty model.
 - Helped asset teams and managers mine for insight.



Set Workshop Goals and Design

Decision Frameworks Project Jumpstart Workshops are customized to the requirements of the participating team's project. A typical workshop lasts from three to five days, depending on the complexity of the decision to be evaluated and the learning objectives set for the project team.

Pre-workshop

A **key decision-maker** proposes the problem/opportunity statement to be evaluated, the key questions the evaluation needs to answer, and the project team members and managers to be involved in the workshop.

Workshop participants send in their top issues related to the decision problem to be evaluated.

An **economist** works with Decision Frameworks to pre-frame the decision and to construct the basic uncertainty.

Sample Workshop Agenda

Day 1 (all participants, as needed) – Decision analysis overview, using a relevant oilfield case similar to the project to be evaluated.

Day 2 (project team members) – Project framing (evaluation set-up), with the goal of developing a few distinctly different project strategies to evaluate.

Day 3 (project team and managers) – Meeting to approve the frame; simultaneous economic model structuring and expert interviewing on key project uncertainties.

Day 4 (project team members, as needed) – Simultaneous completion of expert interviews and economic modeling, as needed; optional basic uncertainty modeling or value-of-information training for project team members.

Day 5 (project team and managers) – Mining for insight from initial uncertainty analysis; meeting with decision-makers to discuss initial results and remaining project schedule development.

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FRAME N' GO WORKSHOPS

DECISION ANALYSIS WORKSHOPS

Are you facing a multitude of oilfield optimization decisions? Attend Decision Frameworks' unique decision analysis training course. You'll sharpen your asset management acumen by learning efficient decision framing and uncertainty analysis skills.

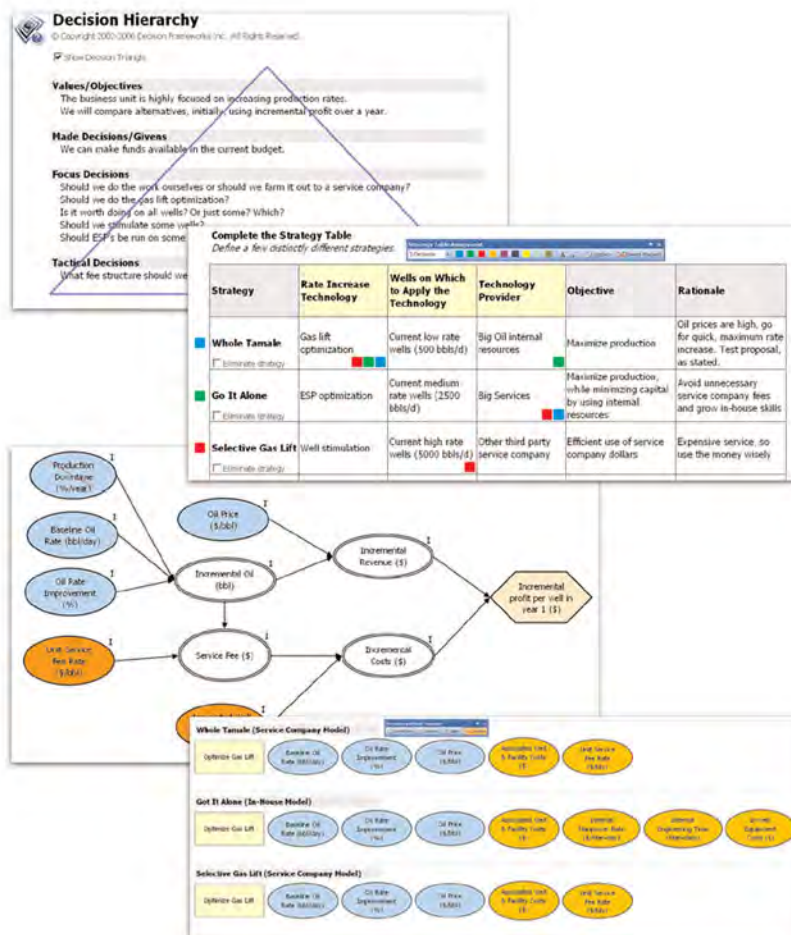
Because real learning comes from doing, the Frame n' Go course is a problem-framing and uncertainty analysis training course that combines a pragmatic mix of theory and application.

Decision Frameworks supplements the teaching of the decision analysis process with practical exercises using typical oilfield operational decisions. Example case studies include:

- Which artificial lift system should we use?
- What is the best well completion strategy?
- Should we repair or replace the pipeline?
- Should we fish? For how long? Or just re-drill now?
- Should we try a new fracture stimulation program?



Frame n' Go features a pragmatic mix of theory and application using day-to-day operational case studies.



Learn to follow a structured problem framing process

Prescription for a Lifetime

At Decision Frameworks, we strongly believe that in order for decision skills to be improved, they must be practiced on a regular basis. Frequent and real-time use of decision analysis will improve day-to-day decisions and allow the process to take root and grow within your organization.

Frame n' Go Development Package

The complete training package combines the standard lectures and manuals with example case studies and state of the art problem - framing and analysis software, called DTrio®. The package helps attendees to make the transformation from merely being aware of decision analysis to becoming regular practitioners of it.

Course Outline

The three-day course follows Decision Frameworks' proven methodology of dividing instruction equally among framing, analysis and communication. The course curriculum includes coaching and practice in:

- Framing decision problems to agree with the appropriate focus and project alternatives.
- Assessing key project uncertainties to understand the range of potential project outcomes.
- Gaining insight from probabilistic analysis to develop new, hybrid strategies to consider.
- Communicating the problem set-up and analysis to ensure clarity and informed decision making with all the stakeholders.

Day 1 – This session introduces the decision analysis process and teaches the fundamentals of problem-framing and uncertainty analysis. Attendees see two complete case studies, one of which they work in small breakout groups.

Day 2 – Participants learn about the natural biases that exist in uncertainty estimations and how to counter-act those biases through expert interviewing techniques and other, more advanced methods. Attendees work through another complete case study.

Day 3 – The focus on the last day is to mine the results of uncertainty analysis for insight to develop hybrid strategies and to communicate the problem frame and analysis results to stakeholders. Attendees hone their problem-framing skills by framing real decision problems in their breakout groups.

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Provide a lifetime prescriptive approach to help the process develop roots and grow.

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ENSURE THAT YOUR TEAMS ARE OPERATING AT PEAK EFFICIENCY!

It is a group's bounded view of a decision problem that they face.

Because all projects are mired in issues, but not all issues are equal. Correct framing achieves clarity and consensus quickly. These are not just important, but critical in determining the best course of action.

By introducing decision framing fundamentals that assist managers and teams to distinguish and address different types of issues. Teams can then easily:

- Define the problem.
- Focus the problem.
- Identify project risks and uncertainties that can make it difficult to choose the best option.
- Structure the alternatives to be considered.
- Use scenarios to test the impact of each alternative.



Sharpen your decision framing skills and achieve success in meeting your project goals—attend a Decision Framing Project Management Workshop from Decision Frameworks.

[illegible]

Framing achieves consensus, management buy-in, and clarity with speed.

REPETITION, RELEVANCE, AND EASE OF USE

Build decision framing proficiency with Decision Frameworks proprietary skill development program. The key tenets of this approach are:

- **Repetition** that integrates lectures with in-course practicum. Over the three-day course, participants work through seven decision frames, increasing skill with each iteration.
- **Relevance** through use of industry-relevant examples that project teams face. Three problems are pre-defined, while four others are based on real-life participant problems. Examples include:
 - General**
Business development, new country / market entry, marketing, or manufacturing strategy
 - Energy**
Exploration, appraisal, development, refining, pipeline, or processing strategy
 - Pharmaceuticals**
Dosing, formulation, indications, lead replacement, early and late trial design
- **Ease of Use** of the decision framing approach through the use of the industry-standard decision framing software tool DTrio®, which is provided with the course. DTrio® guides project managers through the decision framing workflow to ensure quality and efficiency.



Industry-relevant cases are housed in OWL – Decision Frameworks Organizational Wisdom Library, made available to each course participant to evaluate.

COURSE AGENDA

Day 1

Develop more efficient project management skills by learning decision framing using an industry-relevant case.

Day 2

Practice decision framing and learn expert interviewing techniques using an industry-relevant case in the morning and two real decision frames in the afternoon.

Day 3

Refine decision framing and management communication skills using an industry case in the morning and two real decision frames in the afternoon.

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VALUE OF INFORMATION WORKSHOPS

VALUE OF INFORMATION WORKSHOPS

The upstream oil industry is fraught with information decision problems—from reprocessing seismic to testing to phasing the development of fields. Decision Frameworks Value-of-Information (VOI) Workshops offer technical professionals a practical means to learn VOI fundamentals while working their own information decision problems.

What is special about VOI Workshops?

Different focuses for different professionals. Explorers focus on the information that will best help them progress their leads, such as what information to gather in their wells and how to optimize information for their plays. Engineers focus on the best information to gather, from appraisal through development. Their goals are to determine if there are barriers to economic development and to determine what information that will help them optimize their developments and associated production.

Develop skill via a package of products

The Decision Frameworks VOI skill development package both ensures autonomy in the evaluation of basic oilfield information decision problems and provides the foundation for evaluating more advanced VOI decisions over time.

The VOI Workshop skill package includes:

- A practical 13-step VOI process to guide teams through the VOI problem frame and set-up, assessment of key variables, initial valuation, sensitivities, and targeted insights.
- DTrio® VOI software, with the VOI templates, facilitates the framing, problem characterization, and valuation of essentially all oilfield information decision problems. Software capabilities range from standard VOI problem analysis to prospect, play, and development concept selection templates.
- An extensive VOI case library of over 30 VOI cases provides relevant practice and reference both during and following the workshop. Cases range from seismic, well planning, exploration, appraisal, and development to drilling VOI decision problems.
- Real VOI problems are the focus during the afternoons of Days 2 and 3. Real-life application of the workflow and software solidifies process understanding as well as building the attendee's case library.



- **Bring asset teams and their management together to make better information decisions.**
- **Characterize and set up information decision problems correctly.**
- **Perform expert interviews on key uncertainties and the reliability of information to help interpret them.**
- **Perform initial valuations with estimates and run sensitivities.**
- **Determine where information may have value and perform more rigorous analysis only when necessary.**

Workshop Goals

The primary goal of a Decision Frameworks VOI workshop is to build attendee skills. The goal of the first day of the workshop is to develop comfort with framing and valuation of basic VOI decisions. Working with the Decision Frameworks team, attendees set appropriate goals and establish parameters for the asset team. Then, beginning with VOI fundamentals, attendees address VOI decision problems they encounter in their own work. The aim by the end of the course is for attendees to have used the DTrio software capability to complete a minimum of four real VOI decision problems.

Choose Appropriate Workshop Focus

Decision Frameworks VOI Workshops target technical professionals with a workplace focus on information decisions and are thus available in three varieties:

- Exploration focus VOI workshop
- Development focus VOI workshop
- Mixed exploration/development focus VOI workshop

The Day 1 agenda is the same for all VOI workshops. Days 2 and 3 differ, according to workshop focus:

Day 1 – VOI Fundamentals – Practice with relevant pre-defined cases (valuing seismic, core, and logs, testing, appraisal wells, etc.) and DTrio VOI capability.

Exploration Focus VOI Workshops

Day 2 – Prospect VOI – Value information to discern geologic risk factors in order to advance prospects to drillable status and to develop well information plans.

Day 3 – Play and Advanced Exploration VOI – Value prospect order within a play; developing pre-drill sidetrack and appraisal strategy; and valuing plays with a distribution of potential undefined prospects.

Development Focus VOI Workshops

Day 2 – Standard Development VOI – Value information to decide whether and how to develop discoveries common in later appraisal and development.

Day 3 – Advanced Development VOI – Specific focus on valuing pilot programs; appraisal vs. phased development and seismic to optimize development well placement. Target: Completion of at least two more real attendee VOI decision problems.

Mixed Focus VOI Workshops

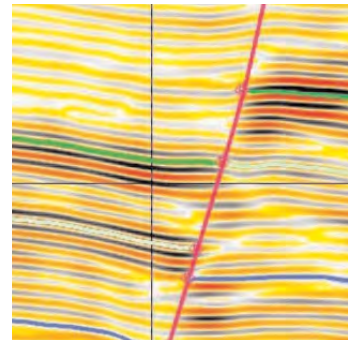
Incorporates Day 2 from both the Exploration Focus and the Development Focus VOI workshops.

Day 2 – Prospect VOI – Value information to discern geologic risk factors in order to advance prospects to drillable status and to develop well information plans.

Day 3 – Standard Development VOI – Value information to decide whether and how to develop discoveries common in later appraisal and development.

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Working with Risk and Uncertainty

As probabilistic models become more powerful and easier to use, it is more important than ever to ensure that the uncertainty ranges and chance inputs are trustworthy. Unfortunately, not all subject matter experts are equally well-grounded in the terminology of uncertainty and in the fundamentals of quantifying one's strength of belief about unknown quantities.

Decision Frameworks Working with Risk and Uncertainty Workshop provides a solid foundation for all those who participate in projects that include considerations of uncertainty and risk, whether they participate as a decision-maker, an observer, an active member of a project team, an analyst, or a subject matter expert.



Develop skill via a package of products

Decision Frameworks skill development package ensures consistency in the assessments of the risks and uncertainties that affect our decisions. This trustworthiness of inputs provides confidence among decision-makers that the analytical results reflect the best information and expert judgment available when the decision must be made.

Workshop skill package includes:

A practical Range and Chance assessment process that guides teams through the assessment of key variables using a structured question set that will reduce biases and elicit objective, well-considered estimates.

Relevant SME Interview software (DTrio) facilitates the definition of variables, open discussion of the basis for current beliefs, and the identification of potential biases. It also provides techniques for consistent quantification of confidence intervals and chance estimates.

Calibration exercises that focus participants on consistently describing their belief of likelihood in terms of probability. Estimates of both range and chance factors are tested, scored, and discussed to help develop familiarity and comfort with probability terminology. Progress in calibration is tracked through several exercises interspersed with course material.

Working with probabilistic models to gain an appreciation of how range and chance assessments will be used in analysis, participants will learn to avoid common mistakes that often cause poor analytical results.

- **Provide a common language for communicating about uncertainty and risk.**
- **Learn to quantify your strength of belief about future occurrences and to avoid misleading verbal descriptions.**
- **Calibrate your estimates through practice and feedback so that confidence level and confidence interval mean the same thing to everyone.**
- **Learn to avoid the most common pitfalls of working with uncertain parameters.**
- **Learn how to assess non-standard variables and inputs.**

Workshop Goals

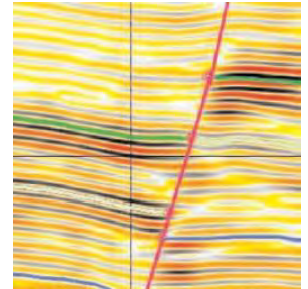
The over arching goal of a Decision Frameworks risk and uncertainty workshop is to build attendee skills in working with and talking about uncertainty assessments. Probabilistic models are more powerful than ever, but will always rely on high quality inputs to generate high quality outputs.

Choose Appropriate Workshop Scope

Decision Frameworks Workshops target a variety of professionals working with uncertainty and risk:

- ½ day workshop – introduction and calibration
- 1-day workshop – more examples and practice, basic analysis
- 2-day workshop – working with “non-standard” assessments
- 3-day workshop – advanced assessments and VOI

The differences among the four versions lie in the depth of the treatment of the topic. While a basic understanding is essential for all, some staff will need to understand how to deal with unusual variables such as averages, interdependencies, and correlations. Still others will want to learn about incorporating into their analyses such things as families of curves, alternative future scenarios, and portfolio considerations.



Half-day Workshop

Designed as an introduction to the topic of working with risk and uncertainty, this workshop includes modules on quantifying uncertainty, expert interviewing workflow, and basic uncertainty analysis. Also, participants will take part in calibration exercises to confirm their understanding and competency in describing their individual strength of belief.

One-day Workshop

The one-day workshop includes the half-day workshop and adds practice in conducting assessment interviews, as well as modules on Decision Trees and Monte Carlo analysis and on common mistakes in using uncertain parameters.

Two-day Workshop

The two-day workshop includes all the material in the one-day workshop and adds modules on chance assessments, averages vs. single occurrences, correlations and interdependencies, and Influence Diagrams & Decision-Risk Timelines. There is also more time available to practice the skills learned.

Three-day Workshop

The three-day workshop includes all the material in the two-day workshop and adds modules on portfolio analysis, Value of Information and assessing information reliability, common VOI mistakes, assessments that aren't single values, time series, and an overview of Experimental Design in probabilistic models.

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DECISION EXCELLENCE A PLAYBOOK FOR LIFECYCLE DECISIONS

APPRAISAL EXCELLENCE OF DEEPWATER RESERVOIRS

DEVELOP, EXECUTE AND UPDATE A QUALITY APPRAISAL
STRATEGY FOR YOUR DEEPWATER DISCOVERIES

decision | FRAMEWORKS

IN THE DEEPWATER OIL AND GAS INDUSTRY, wells routinely cost over \$100 million USD and developments in the billions of dollars. These high costs, coupled with the complexity of the discoveries, drive teams to employ a structured decision quality approach to their appraisal and development decision making. Key to success is a clear, dynamic appraisal strategy which may be revisited and modified as additional information comes in to ensure the right development decisions are made.

To meet these challenges, Decision Frameworks spent over two years developing a unique, yet practical methodology and training course, designed to train deepwater teams to use efficient workflows to frame and evaluate value adding appraisal strategies. In this workshop, participants frame appraisal options, forecast uncertainty reduction potential and develop the business case for discoveries at key points in time, always addressing the important questions:

- What are the main uncertainties and how might they play out?
- How would those uncertainties impact development decisions?
- What appraisal information might we consider to reduce them?
- How well will appraisal reduce those uncertainties?
- Can a business case be made for that appraisal?

FOUR STAGES OF DEEPWATER APPRAISAL

As a best practice, deepwater appraisal planning is often conducted in the context of four key phases in the life of an exploration well and discovery. Each time frame addresses questions with supporting case examples to structure and clarify the deepwater appraisal process.

- **Time zero, prior to discovery - What is the best appraisal strategy in the event of discovery?**

Case example – Discovery well scenario thinking - What are possible outcomes of a discovery well, what would those scenarios mean to development and what appraisal actions would make sense given they occur?

- **Time one, at discovery - What is the best appraisal strategy upon discovery?**

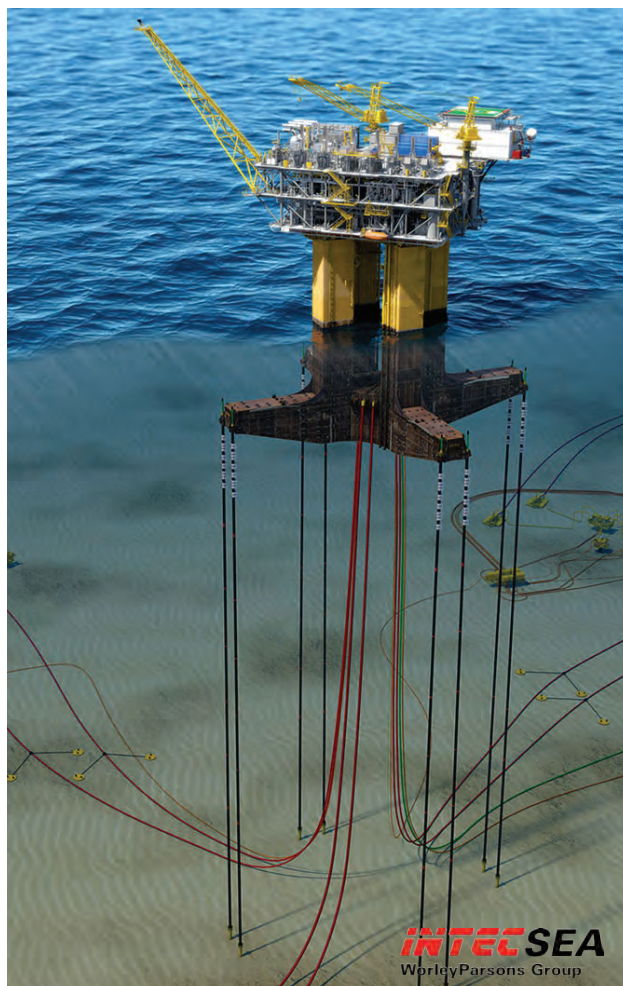
Case examples - Appraisal well planning (order, locations, testing & coring)

- **Time two, prior to final concept select – Should information be gathered to finalize the development concept?**

Case examples – Interference testing, Early Production Systems

- **Time three, enabling appraisal during the producing phase - What data/equipment should we put in place at development to enable information gatherings during production to optimize recovery?**

Case examples – 4D seismic, downhole gauges, test loops



“With this course, teams clearly understand their walk and go forward points – truly helping them optimize their spending programs and development decisions.”

KEY FEATURES

- **Hands-on, Interactive:** Participants work through a number of relevant pre-defined deepwater appraisal case studies and real-life problems brought to class.
- **Structured Approach:** Attendees learn a step-by-step methodology to frame, evaluate and compare appraisal strategy options.
- **Clear Understanding of De-risking:** Course participants receive clear guidance to enable them to estimate uncertainty reduction for each appraisal strategy and to incorporate those numbers into their evaluations.
- **Clarity:** Attendees use simple uncertainty reduction plots of alternative appraisal plans to bring insight and clarity of action.
- **Case Study Reference Library:** Participants receive a library of relevant and detailed example case studies, showing the steps of the frame and evaluation.
- **Common Problems:** The most typical of problems encountered in deepwater are worked as both pre-defined and real-life case examples brought to class.
- **Supported by Software Tools:** Participants receive a copy of DTrio, our decision framing and value-of-information analysis tool set, which guides the user through the full appraisal workflow.



Learn to use “Oracle” Trees to gain insight into appraisal plans by displaying subsurface scenarios and the development decisions they affect.

AGENDA

Day One

Learn and practice appraisal framing fundamentals
Time Zero appraisal framing (scenarios in the event of discovery)
Time One appraisal framing (well planning upon discovery)

Day Two

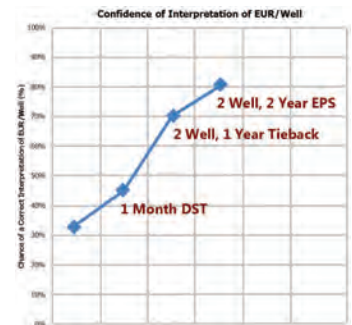
Evaluate elements of appraisal strategy with value of information (VOI) fundamentals
Framing and evaluating 4D seismic, core, and testing strategies

Day Three

Frame and evaluate later appraisal for development optimization decisions
Time two and three appraisal
Interference testing for concept select and Early Production Systems

Day Four

Frame and evaluate real-life problems brought to class
Jumpstart the framing and evaluation of real deepwater appraisal strategies
Develop the frames, forecast the uncertainty reduction and structure the business cases



Develop uncertainty reduction plots of alternative appraisal plans to bring clarity of action.

CONTACT INFORMATION

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A PLAYBOOK FOR LIFECYCLE DECISIONS

APPRAISAL EXCELLENCE WORKSHOP IN UNCONVENTIONAL RESERVOIRS

APPRAISAL EXCELLENCE IN UNCONVENTIONAL RESERVOIRS AND RESOURCE PLAYS

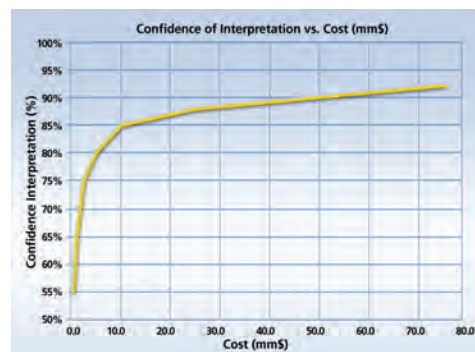
DEVELOP, EXECUTE AND MODIFY ROBUST APPRAISAL STRATEGY FOR YOUR UNCONVENTIONAL RESERVOIRS

Unconventional resource plays are breaking the rules of conventional decision wisdom. Rules of thumb developed over years of producing conventional assets are no longer always applicable and teams are struggling to uncover the new appraisal protocols. In addition, the demarcation between appraisal and development is blurred as teams are attempting to simultaneously hold acreage, explore, appraise and develop, ever striving to increase the pace to the final commercial sanction. Decision Frameworks has wrestled with this challenge and has developed a practical training course, specifically designed to teach teams a proven workflow to design and evaluate unique and compelling appraisal strategies. The course aims to answer the following questions:

- What are the key uncertainties and which appraisal options should we consider to address them?
- Is there value in running a pilot to determine the optimal well spacing and, if so, what is the best pilot design?
- Do we want to run a completions pilot and how should we configure it?
- Does well orientation matter and would a field demonstration help determine it?
- Can we justify seismic to high grade our drilling plan and how do we value it at a program level?

KEY FEATURES OF THIS TRAINING WORKSHOP INCLUDE:

- Hands-on, Interactive: Attendees work through a number of unconventional appraisal case studies.
- Structured Approach: Attendees learn a step-by-step method for agreeing the appraisal strategies (or designs) to consider and for evaluating and comparing each strategy.
- Clear Understanding of De-risking: Attendees receive clear guidance on consistently estimating uncertainty reduction for each appraisal strategy and on incorporating those numbers correctly into their evaluations.
- Simple uncertainty reduction plots of alternative appraisal or pilot programs bring great clarity.



Simple uncertainty reduction plots of alternative appraisal or pilot programs bring great clarity.

- **Case Study Reference Library:** Attendees receive a library of relevant and detailed example case studies, showing the steps for approaching the most typical of problems encountered in unconventional, including seismic acquisition, and spacing and completion pilots, and many more.
- **Supported by Software Tools:** Attendees receive a copy of DTrio, our decision framing and value-of-information analysis tool set, which guides the user through the full appraisal workflow.

The Decision Frameworks approach is an amazing team tool, providing a means to elicit open dialogue between all team members, from technical through management. With this course, teams clearly understand their walk and go forward points and rationale for them - truly helping them optimize their spending programs.

DAY ONE

Framing appraisal strategy of unconventional resource plays: Learn and practice the fundamentals of framing appraisal strategies, from brainstorming the ideas and issues to consider through to designing different and compelling appraisal strategies.

DAY TWO

Evaluating appraisal strategy through basic value-of-information analysis (VOI) techniques: Learn the basic principles of VOI analysis and how to apply those principles to evaluations of appraisal strategy. The focus is on "go / no go" decisions, where we are deciding whether or not to continue the asset development. Case studies include seismic for unconventional resource development and spacing pilot design.

DAY THREE (& OPTIONAL DAY FOUR)

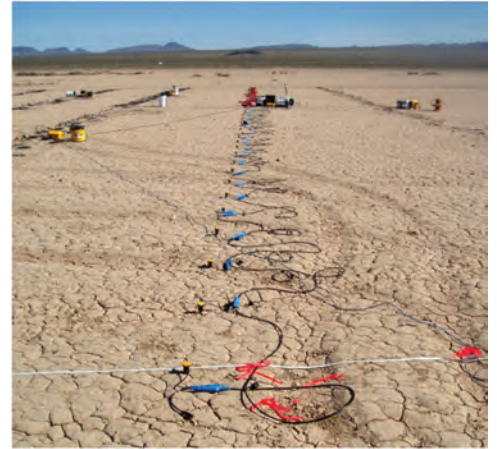
Evaluating appraisal strategy through extended VOI techniques, information reliability, and uncertainty reduction plots: Learn to extend the VOI principles into more the more complex "how to go problems" or optimization decision problems, like completion and drilling strategies. These are common problems in unconventional appraisal but we first need the VOI fundamentals learned in Day 2. Also, learn to apply expert interviewing techniques and basic statistics to assist your assessments of information reliability. Learn to convert information reliability into uncertainty reduction plots to expand the insight of your evaluation.

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"With this course, teams clearly understand their walk and go forward points and rationale for them - truly helping them optimize their spending programs."