

# ***Real Options in Practice: Two Examples from the Energy Sector***



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**DAAG (Decision Analysis Affinity Group) 2000**

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# Outline

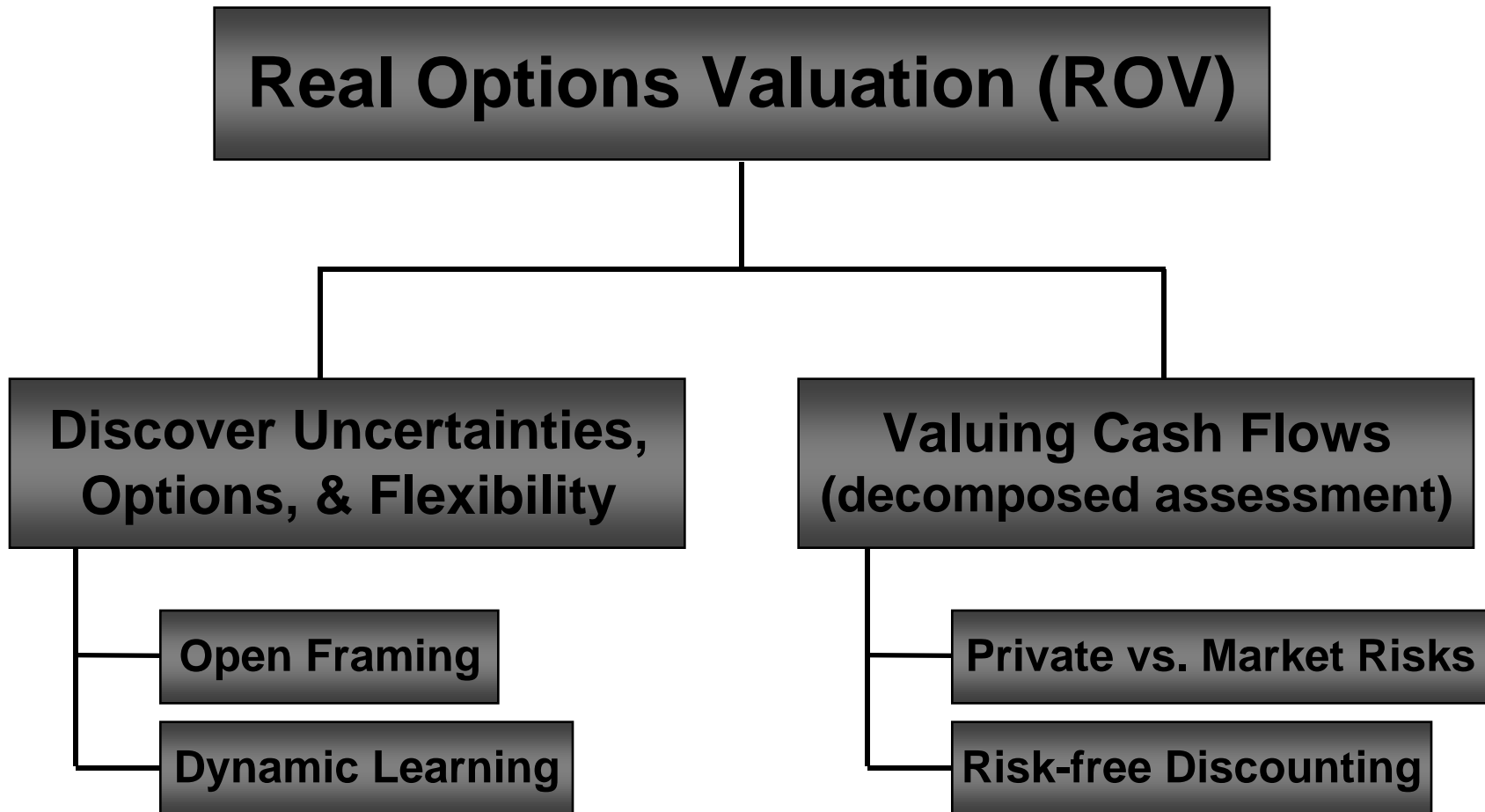
- **What is different about Real Options?**
  - Modeling options and managerial flexibility
  - Valuing cash flows
- **Example 1: New Technology**
- **Example 2: Offshore Opportunity**
- **Conclusion**

# Why Real Options Valuation (ROV) ?

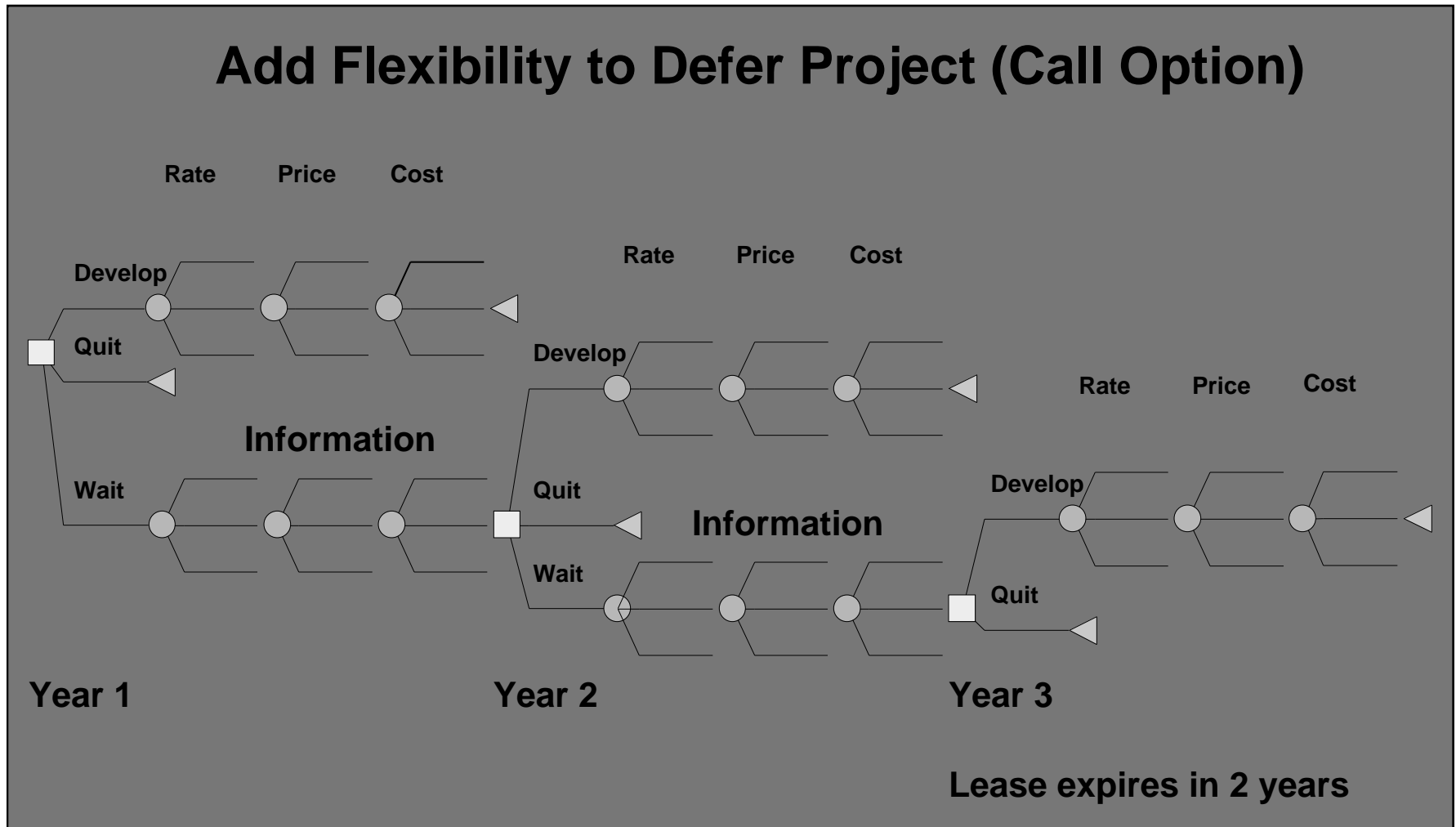


**Real Options Valuation (ROV) combines and extends DCF, Option Pricing, and Decision Analysis**

# The two dimensions of Real Options Valuation

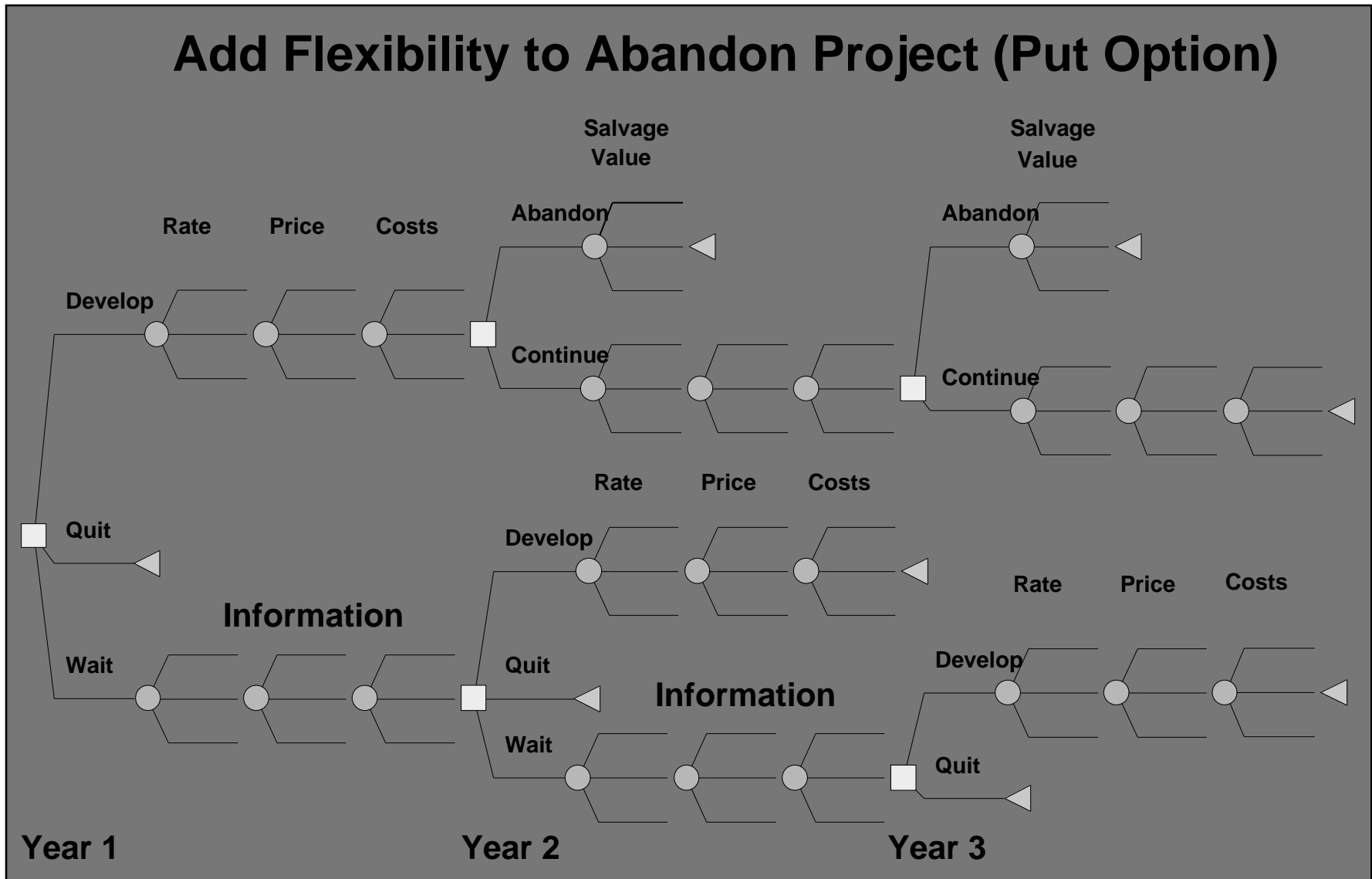


# What are real options?



# What are real options?

## Add Flexibility to Abandon Project (Put Option)



# **Value cash flows with appropriate risking**

- **Use option pricing to model “market” (e.g., price) risk:**
  - **Apply risk-adjusted probabilities to capture risk premium (can determine from futures and options markets)**
- **Use decision analysis to model “private” (e.g., volume) risk:**
  - **Apply subjective probabilities to risk “non-tradable” assumptions (can determine from historical databases and expert assessments)**
- **Discount the resulting risk-adjusted cash flows at risk-free discount rate**

# Who uses ROV?\*

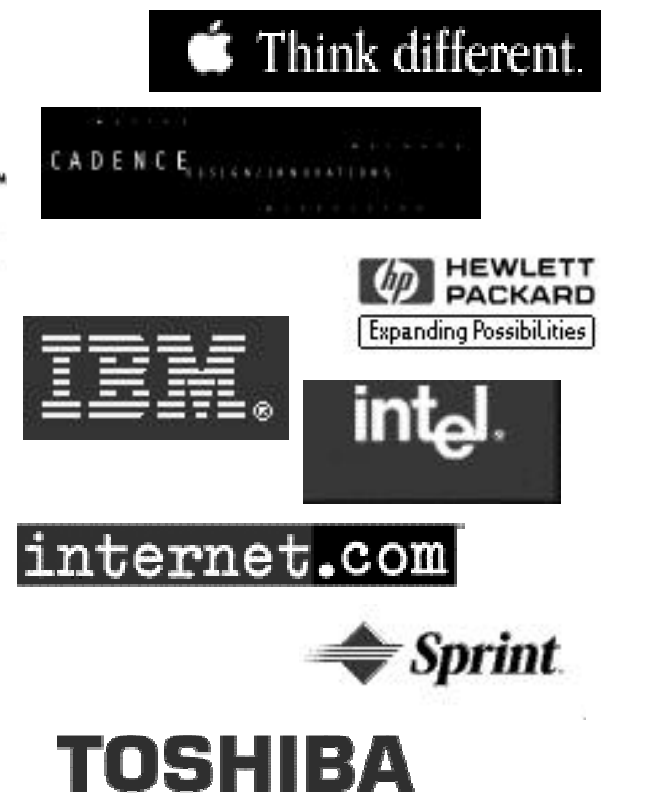
## Energy



## Investment Banks /Consultants



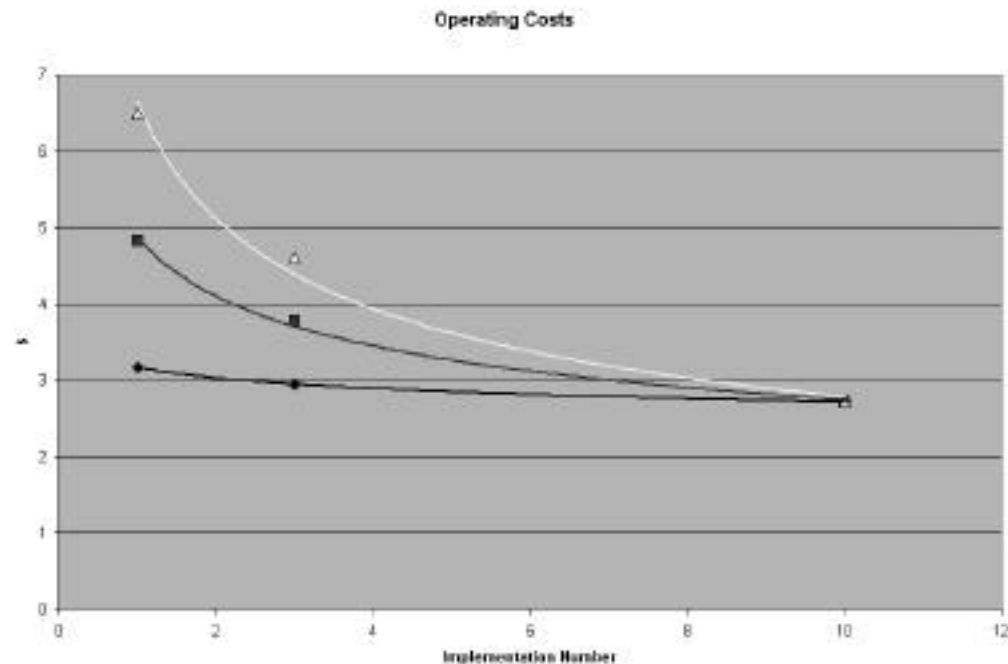
## Computer/Internet Telecommunication



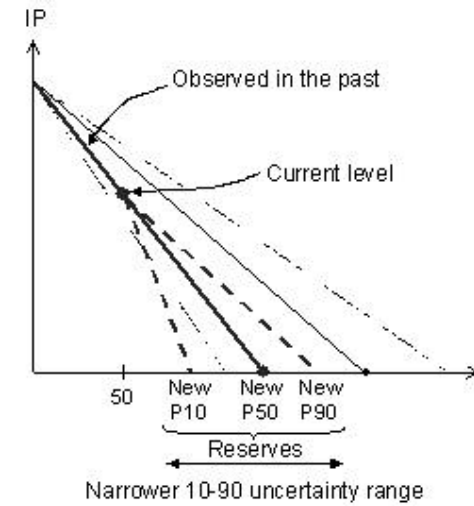
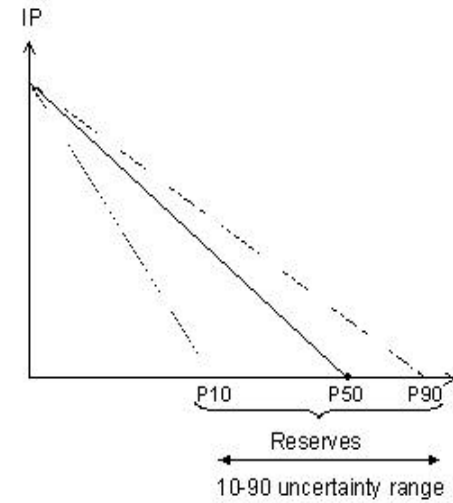
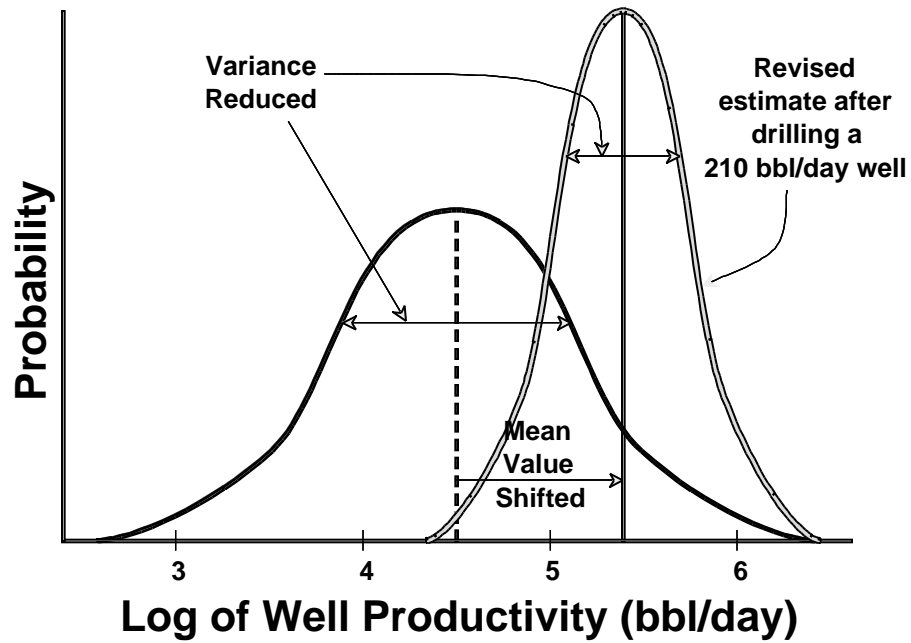
\* partial list

# Learning

- Enhance subsequent decisions (option value) by incorporating learning on new information
- Learning occurs at differing speeds and in a variety of ways

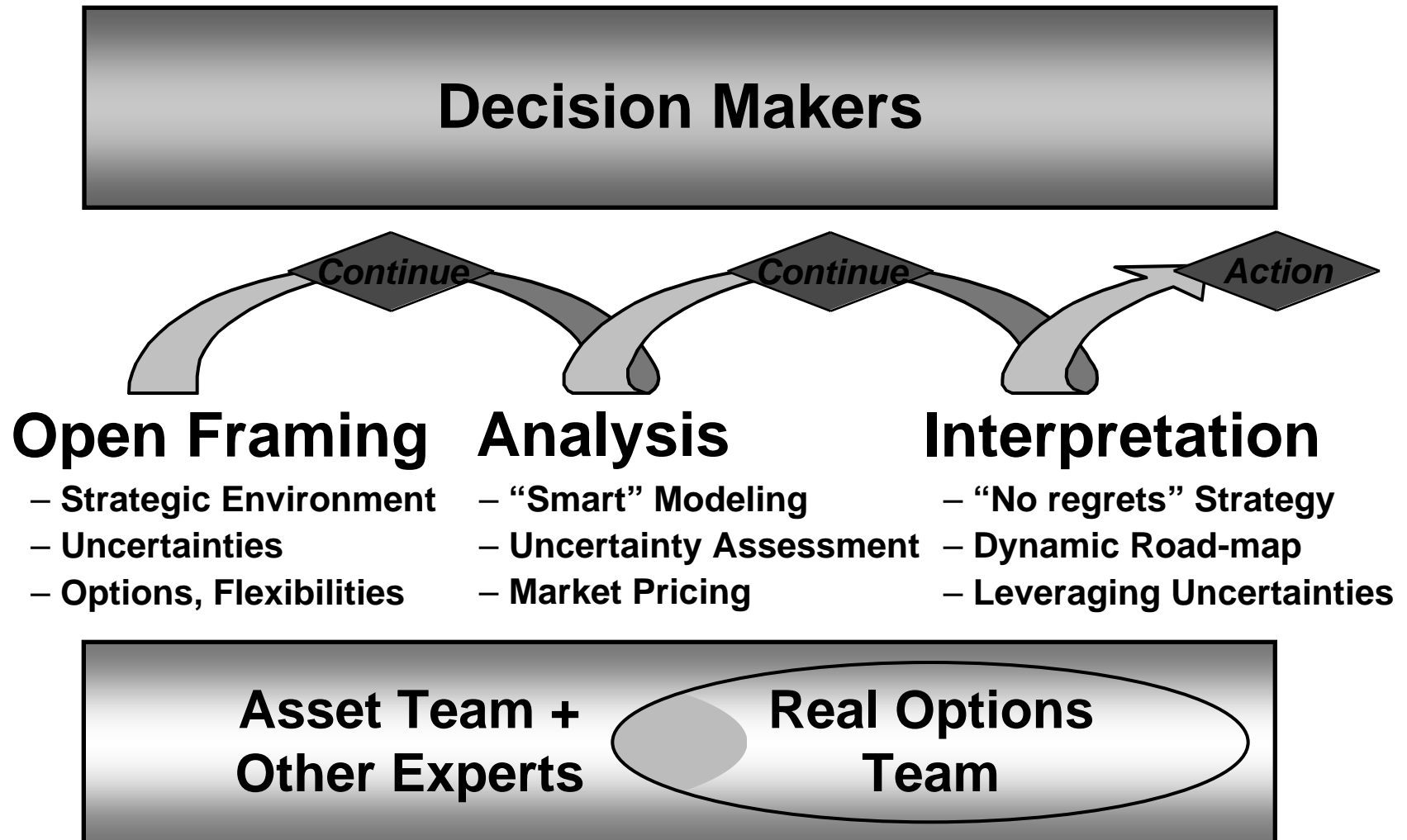


# Learning



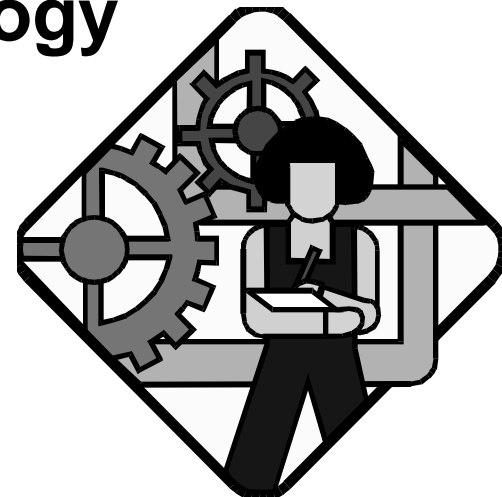
Graphs courtesy of ADA(PwC)

# ROV is not simply a better tool. It is an objective, all-embracing process.



# Example 1: New Technology

- **From commercial standpoint, relatively unproven technology**
- **More than one source of technology, with providers at differing points in development and experience**
- **Anticipate variations in technology performance and costs, depending on provider**



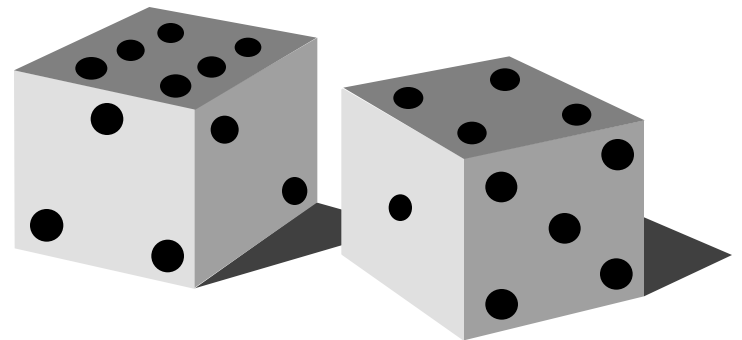
# Questions

- **Should we make a major commitment to this technology?**
- **What commercial opportunities exist for application of this technology in the long-term?**
- **In the short-term, on which commercial opportunities and technology provider(s) should we focus?**
- **How does commercial application of this technology look from a portfolio perspective?**



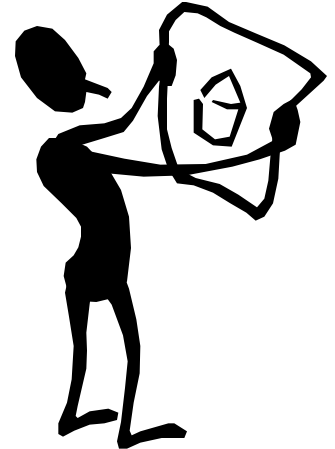
# Areas of major uncertainty

- **For each provider, technology effectiveness and cost**
- **For each provider and location, installation and operational costs**
- **Prices of inputs and end-products**
- **Potential for non-technical delays**
- **Contractual terms and taxes in various locations**



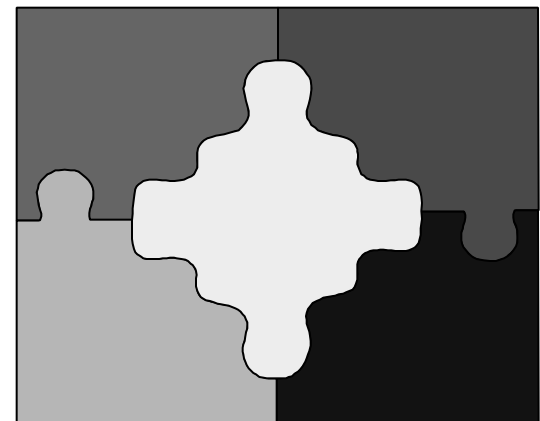
# Decisions to be evaluated

- **Which technology provider(s) should we use?**
- **Should we do more testing before committing to the technology?**
- **What implementation size is best?**
- **What implementation schedule is best?**
- **When should we take advantage of potential synergies?**

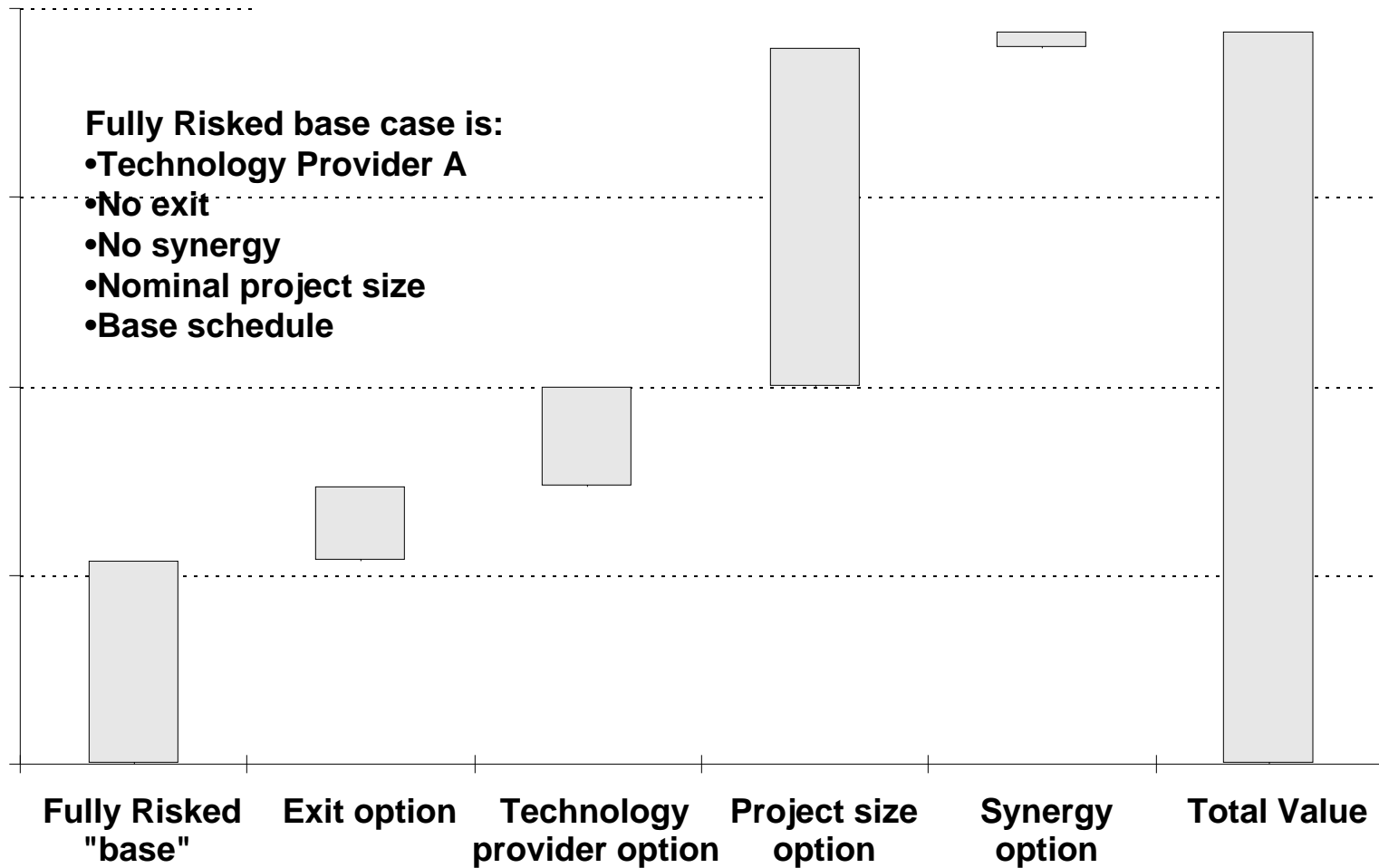


# Approach taken

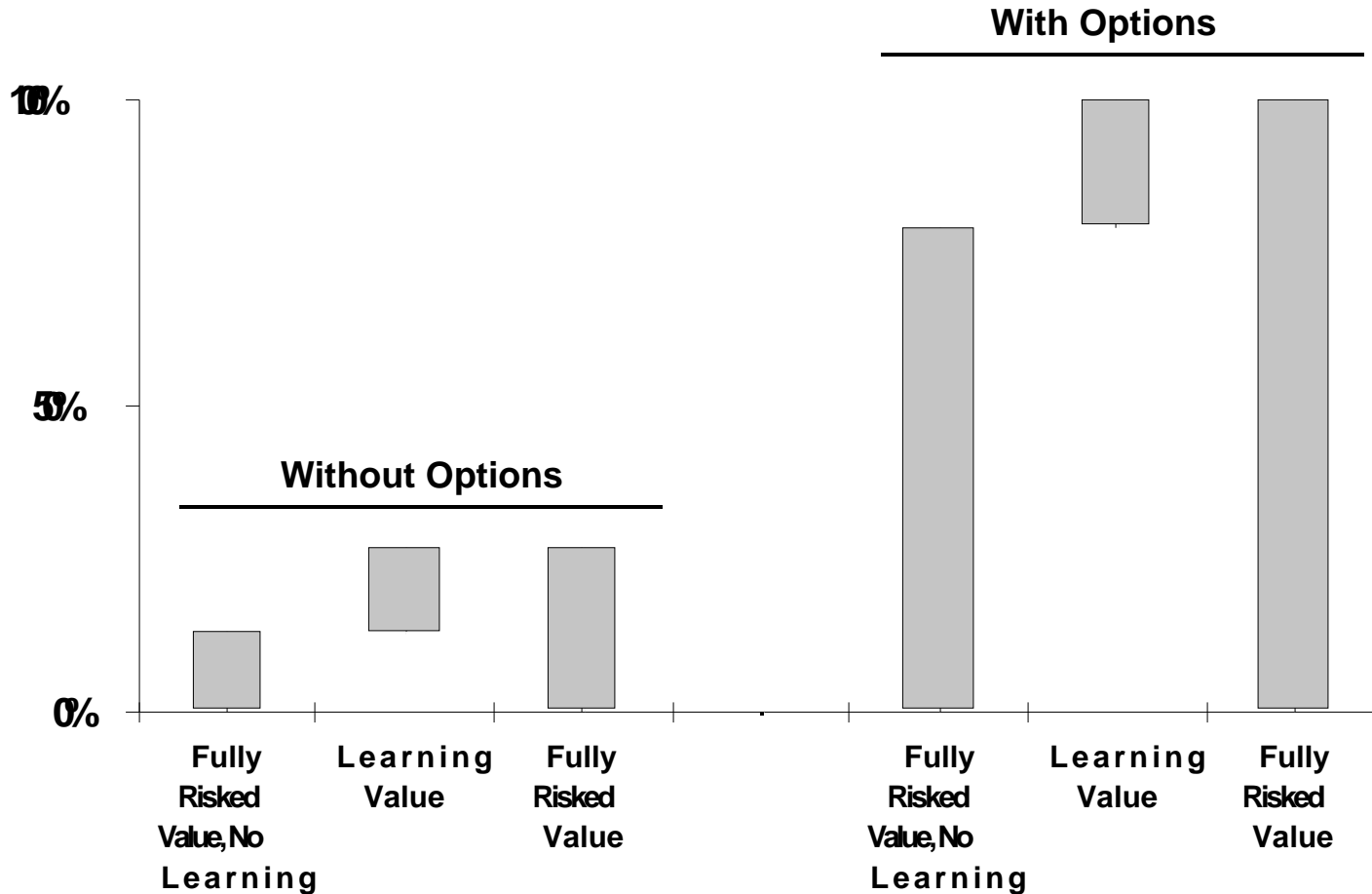
- **Modeled approximately 10 separate opportunities**
- **Evaluated 3 separate schedules**
- **Treated as a “portfolio” of opportunities**
- **Placed significant emphasis on learning from project to project within each schedule**



# Sources of option value

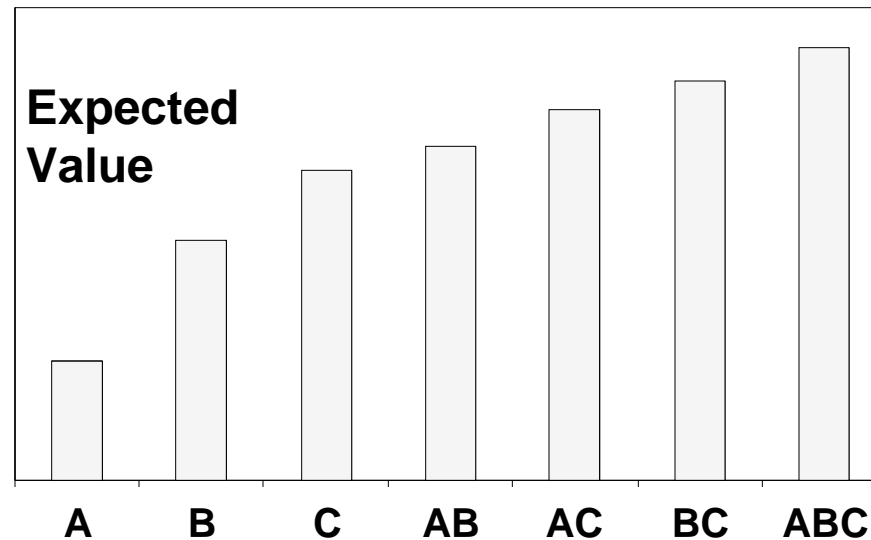


# Relative value of learning\*



\* learning about technology, operating efficiency, operating costs, and capital costs

# Keeping all technology providers available is the best choice



- **No single provider is always the best choice**
- **For most opportunities, having a choice of technology providers is best**

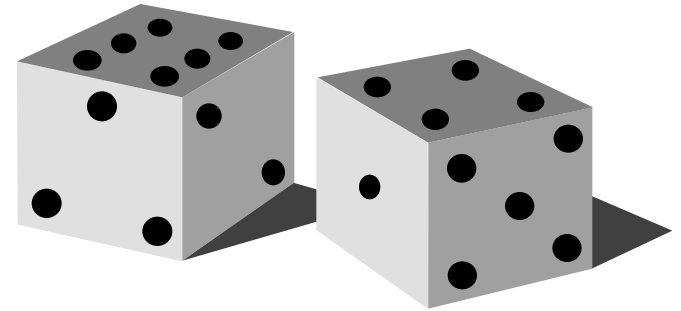
## **Example 2: Offshore Opportunity**

- **Harsh or unique conditions**
- **May be little or no infrastructure in place**
- **Costs are higher**
- **Operations more difficult**
- **Large reserves**



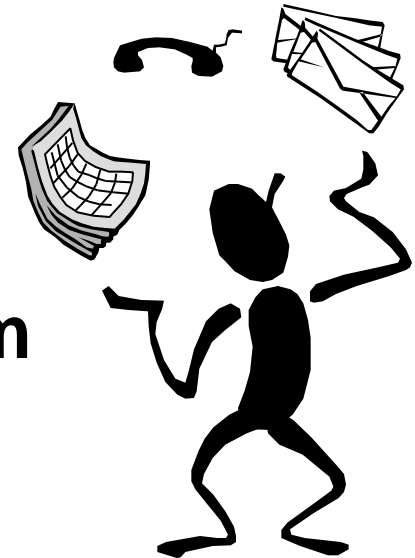
# Areas of major uncertainty

- Amount of oil and gas
- Recoverable oil and gas
- Drilling and platform costs
- Value of oil and gas
- Impact of delays
- Contractual terms, regulations, political issues, special environmental issues

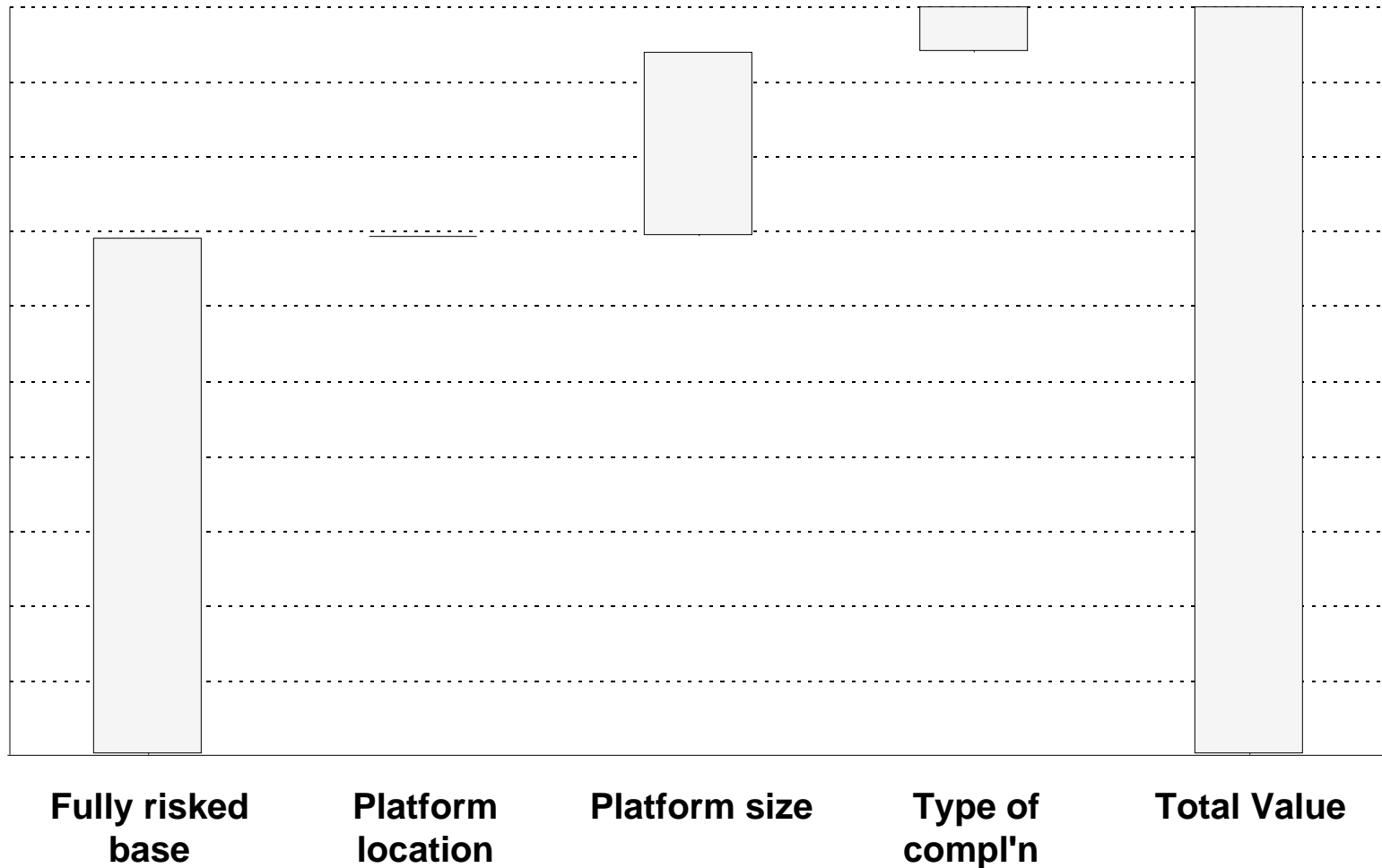


# Decisions to be evaluated

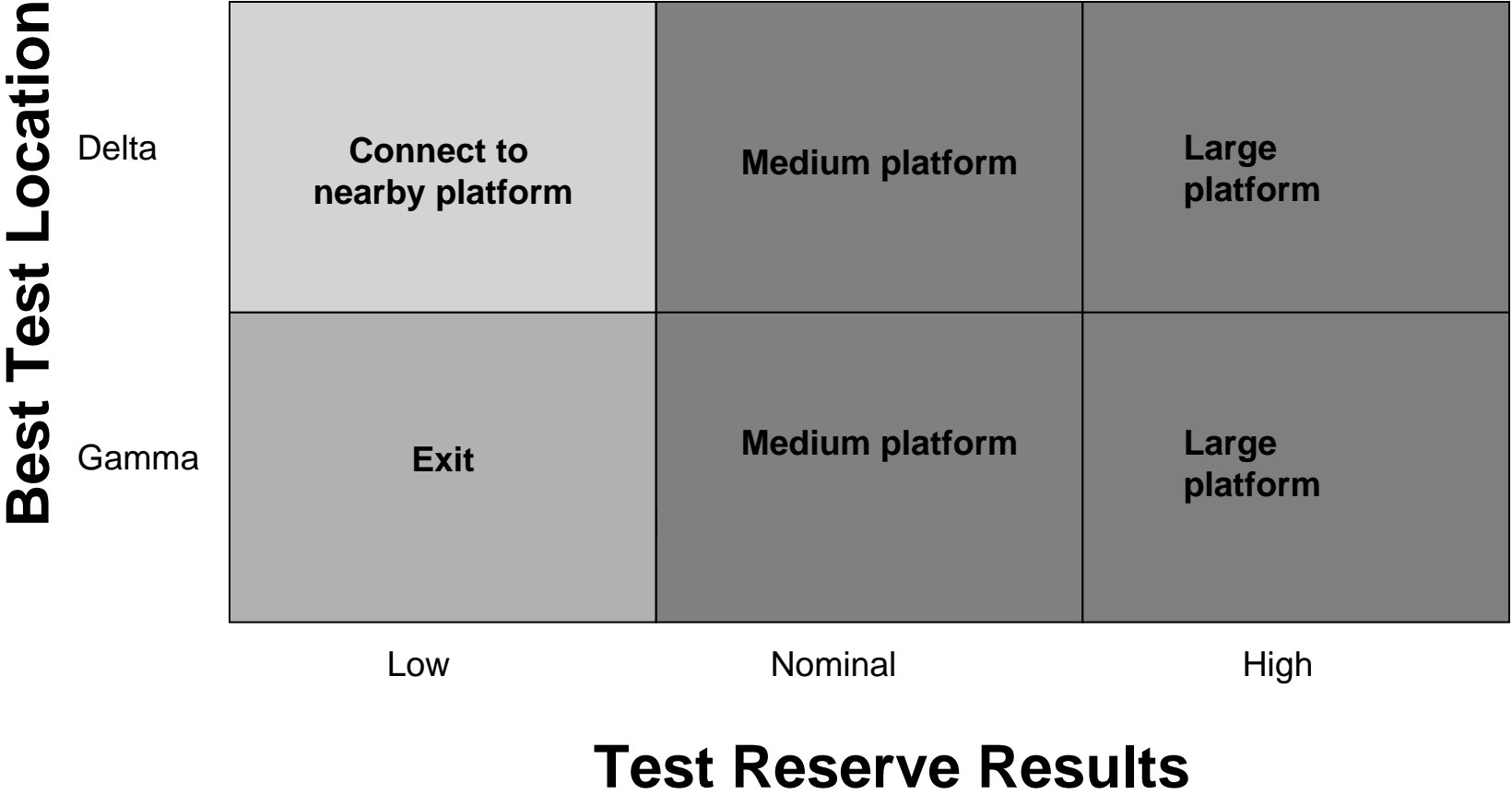
- **What size should the platform be initially?**
- **Should the platform be expandable?**
- **When should we expand the platform? How much?**
- **Should the development plan be rapid or staged?**
- **Should we handle production from other opportunities?**



# Sources of option value

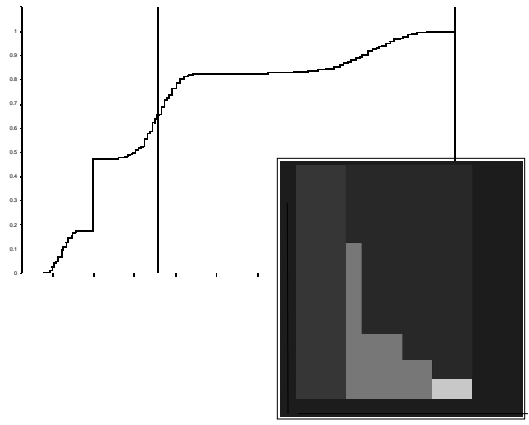
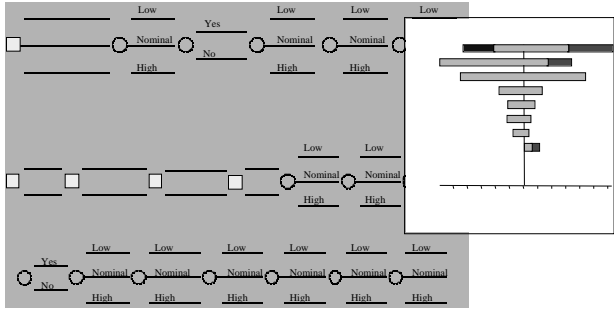


# Optimal strategy map

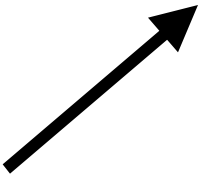


**Results**

**Calculations and Analysis**



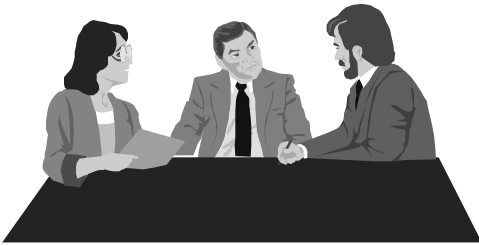
**Opportunity  
workbook**



**Model  
Building**



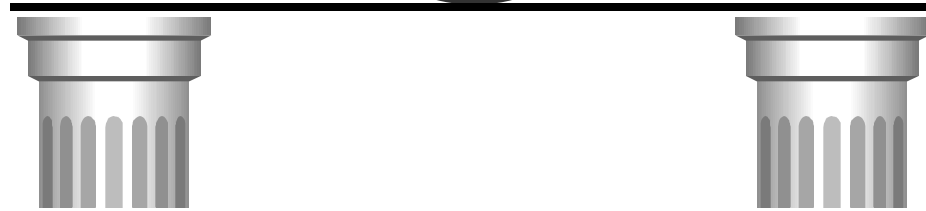
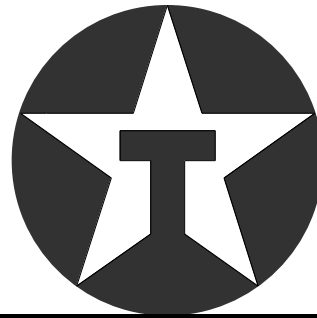
**Expert Assessments**



**Open Framing Session**



# The long-term challenge is a cohesive, enterprise solution



**Strategy**

Real Options  
Valuation

Portfolio  
Optimization



**Execution**

Enterprise Risk  
Management

Value-Based  
Accountability

