

Value of Information Misapplied

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Value of Information?

Definition:

A value of information analysis answers the question:

"do the benefits gained by virtue of having new information more than offset the cost of gathering and acting on it?"

Overview

- Lessons from school of hard knocks
- Four specific examples
 - You diagnose the problem
 - Compare with Phil's conclusions
- Summary and warnings.

Brent's Top Five VOI Pitfalls

- Using VOI to justify decision that's made already.
- Failing to specify what action(s) could change after receipt of new info.
- Assuming that new info changes the state of nature.
- Failing to count the full cost of obtaining new information
- Defining & gathering wrong or bad information.

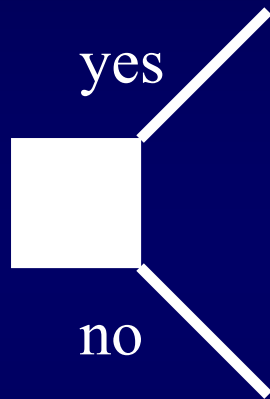
Example 1

Discovered Reserves Size

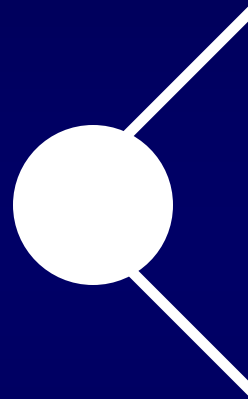
The Frame

- Discovered reservoir
- "Reserve Size" is key uncertainty
- 3D seismic data expected to reduce uncertainty by imaging reservoir better

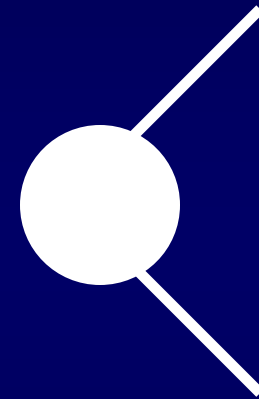
Example 1 - Decision/Risk Timeline



Shoot 3D



Size
Indication



Actual
Size

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Example 1

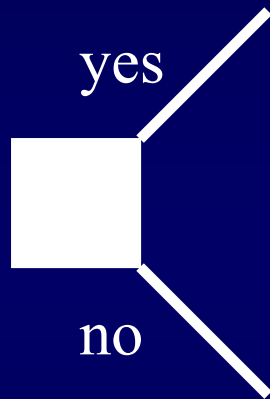
What's Wrong Here?

Example 1

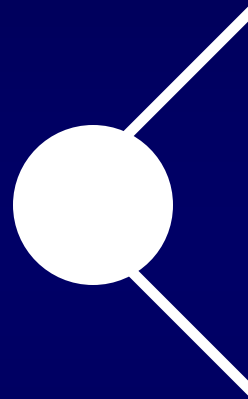
What's Wrong Here?

- No possibility to change/improve decisions based on new information

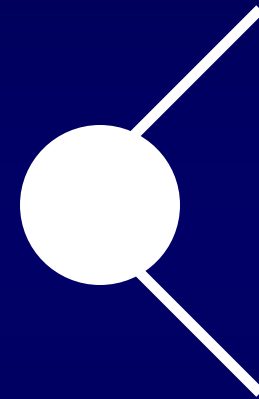
Example 1 - Decision/Risk Timeline



Shoot 3D

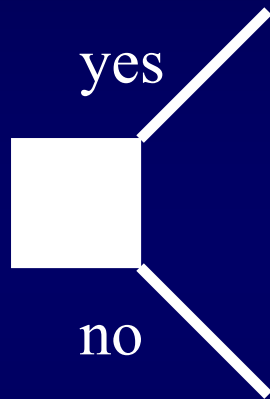


Size
Indication

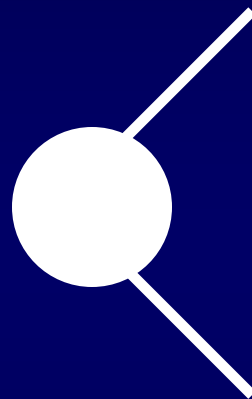


Actual
Size

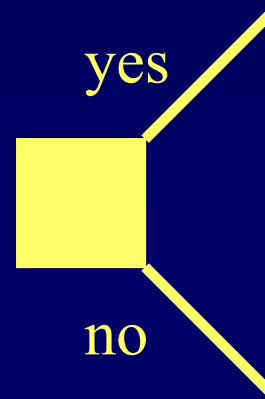
Example 1 - Decision/Risk Timeline



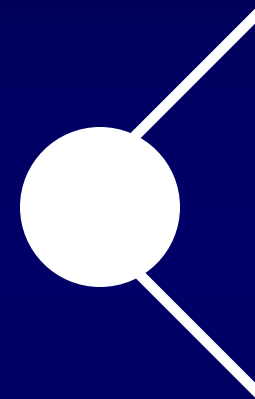
Shoot 3D



Size
Indication



Build
Platform



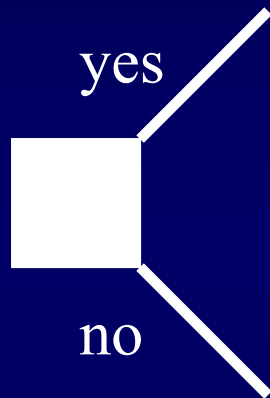
Actual
Size

Example 1

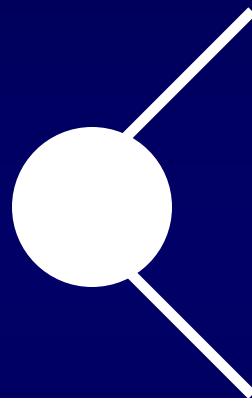
What's Wrong Here?

- No possibility to change/improve decisions based on new information
- Proper recognition of decision would have avoided some negative outcomes.

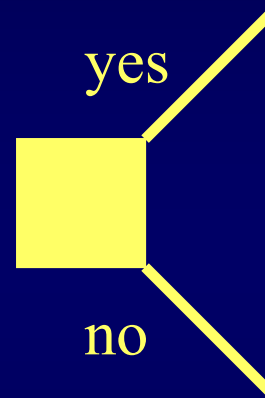
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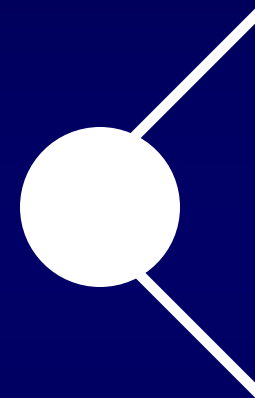
Shoot 3D



Size
Indication



Build
Platform



Actual
Size

Example 1

What's Wrong Here?

- No possibility to change/improve decisions based on new information
- Proper recognition of decision would have avoided some negative outcomes.
- Probabilities don't add up.

Probabilities

No 3D

Total possibility of "high" reserves outcome = 0.25

With 3D

Total possibility of "high" reserves outcome =

Upgraded $0.2 * 0.50 = 0.10$

No Effect $0.6 * 0.25 = 0.15$

Downgraded $0.2 * 0.10 = \underline{0.02}$

Total 0.27

Example 1

What's Wrong Here?

- No possibility to improve decisions based on new information
- Proper recognition of decision may have avoided some negative outcomes.
- Probabilities don't add up.
- No consideration of 3D cost/delay

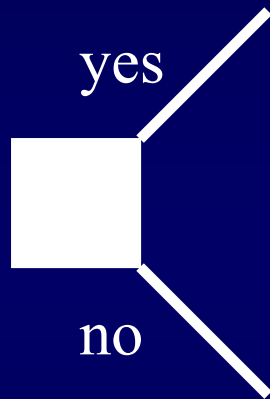
Example 2

Probability of Discovery

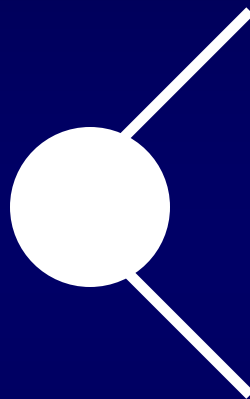
The Frame

- Portfolio of existing prospects
- P_s is key uncertainty for each prospect
- 3D seismic data will reduce uncertainty by better imaging structures

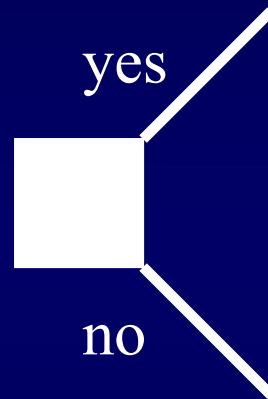
Example 2 - Decision/Risk Timeline



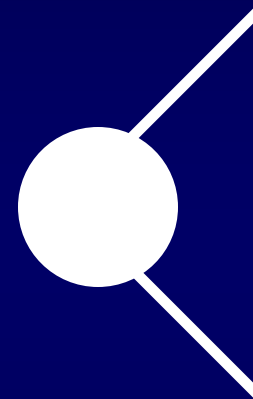
Shoot 3D



Probability
Indication



Drill
Prospects



Discovery
or No

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Example 2

What's Wrong Here?

Example 2

What's Wrong Here?

- **Full range of outcomes not considered**
3D would not affect all prospects similarly
Tree assumes all prospects drilled (or all abandoned)
- **P_s not clearly defined**
Looks like probability of at least 1 success
- **Reserves valuation is suspect**
Notional value/bbl too simple for incremental output

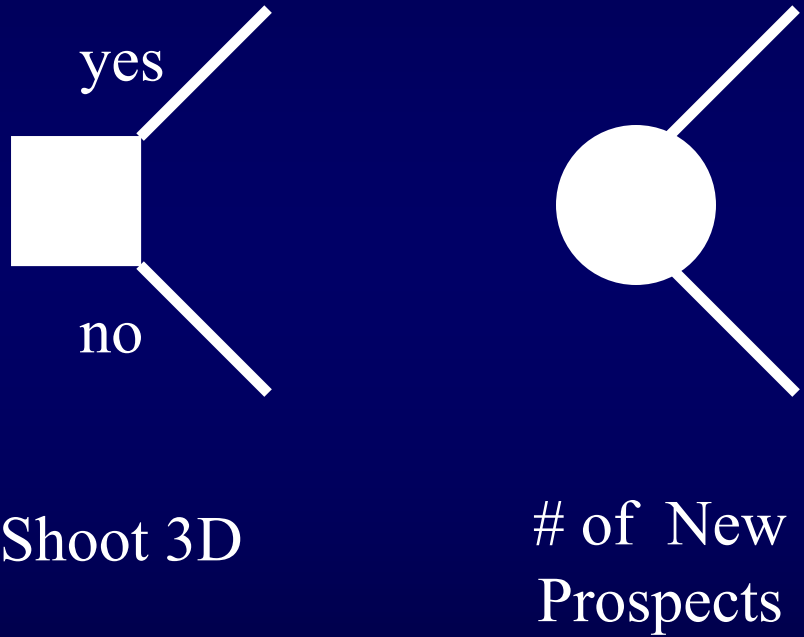
Example 3

3D Finds New Prospects

The Frame

- 3D info enables optimization of existing prospects and discoveries
- Experience had shown that 3D info likely would reveal new prospects
- Some prospects will have enough value to drill, some not

Example 3 - Decision/Risk Timeline



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Example 3

What's Wrong Here?

Example 3

What's Wrong Here?

- Is £ 1 MM EMV enough to justify 3D?
- Drill a £4 MM EMV prospect?
- EMVs are usually in \$, is £ correct?
And is it gross or net?
- Are new prospects really dependent?

Is the chance of finding multiple prospects a product of independent events?

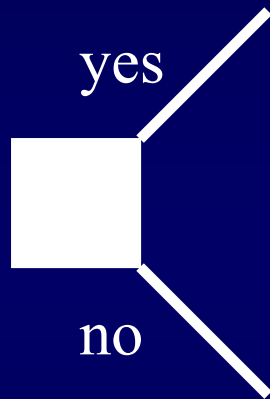
Example 4

Production Well Location

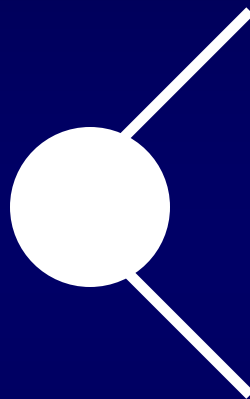
The Frame

- Drill another well to add/speed output in highly faulted reservoir?
- 2D data: 95% chance of dry hole, so extra well wouldn't be drilled
- 3D data: increased chance of "seeing" a good well location; avoiding dry hole.
- Possibility that 3D "says" drill no wells

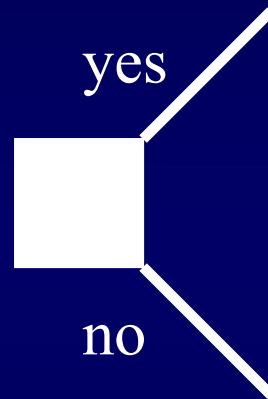
Example 4 - Decision/Risk Timeline



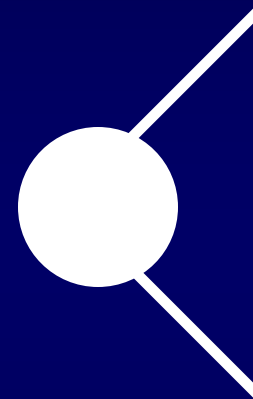
Shoot 3D



Clear Well
Location?



Drill
Prospects



Discovery
or No

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Example 4

What's Wrong Here?

Example 4

What's Wrong Here?

- Negative EMV outcomes have been included in the calculation of value
- Unclear how "Drill" EMVs were calculated, e.g., costs?

Learning Summary

- VOI is a cost/benefit analysis
- New info does not add value unless we can act upon it.
- Count carefully the cost of info
- Understand the full range of possible outcomes and their probabilities