Indifference and Why You Should Care – Helping Teams Build Decision Confidence

Bill Haskett – Haskett Consulting International Limited
Frank Wimberley – Teck Resources Limited

The Quick Story

This is an approach you can use to assist decision-making given uncertainty.

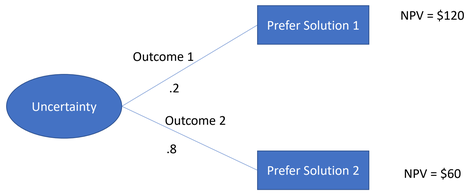
Teams facing an important decision may mis-spend substantial time trying to achieve precision on what will happen when it is usually as important, if not more so, to understand where, how, and why the decision would change. Indifference Assessment can provide confidence, relieve concern, and provide an understandable context for the decision.

Indifference is the specific outcome within a distribution of possible outcomes, at which a decision-maker would be indifferent to the decision path chosen. The ideal action below this point differs from the ideal action above. In most decision trees, the indifference assessment is arithmetically simple.

The further the expected result is from the indifference point, the less precision is required in the estimation of the expected result. If the expected result is far from the indifference value, then decision confidence should be high. The range of the uncertainty must also be taken into consideration. Conversely, as the expected result nears the indifference point, the probability of making an incorrect choice increases. Remember that as the probability of being wrong increases confidence decreases, and the value of doing more work to clarify the decision increases, so we must also look at the confidence range of the uncertainty.

As with Value-of-Information (VoI), the degree of precision and therefore the time and cost to achieve it has no value if it doesn't have a likelihood of altering the decision. The contrast to VoI is that an indifference assessment does not require the option to obtain new information. It merely balances the two paths extending from a binary decision point.

Taking an "Indifference Approach" enables faster, more confident decisions. It provides decision-makers with sound logic and clarity on decisions large and small. Everyone wants to make the correct decision. One cannot do that without a clear understanding of the conditions that would cause you to not care which path is chosen.



If you had to choose now, which preferred solution would you choose?

Solution 1 has a 20% probability of occurring and a $120 NPV for an Expected Net Present Value (ENPV) of $24

Solution 2 has a 80% probability of a $60 NPV for $48 ENPV *(hint: this one wins)*

Two Indifference Points are possible. One for each metric.

The Probability Indifference is the probability split that creates equal ENPV on each limb.

The Value Indifference is the value change of one outcome such that the ENPV equals that of the other limb.

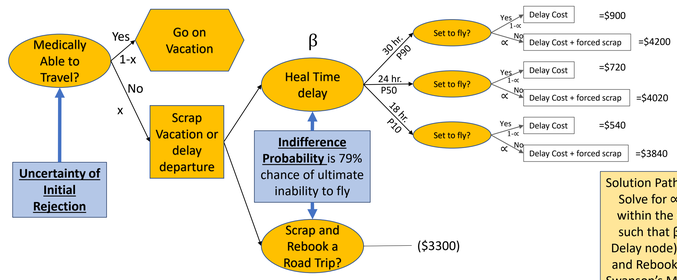
Probability Indifference	Value Indifference
At what **probability** would you be indifferent to the solutions? X*120 = (1-X)*60 then we solve for X 120X=60-60X 180X=60 X=60/180 = 33% P(Outcome 1)=33%, P(Outcome 2)=(1-P(Outcome 1)) = 66% The probability of Outcome 1 would have to be greater than 33% in order to prefer Solution 1.	At what **value** of Solution 1 would you be indifferent to the solutions? Solve for Value $_1$: P(Outcome 1) * Value $_1$ = P(Outcome 2) * Value$_2$ Value $_1$ = (80% * $60) / 20% Value $_1$ = $48 / 20% = $240 Solution 1 would have to increase to over $240 before you would not prefer Solution 2.

Does either indifference solution cause concern?

Yes, it is a simple concept but it is often forgotten as we easily fall into the trap of trying to precisely predict what will happen, as opposed to assess where our decisions change.

It is usually better to have confidence that what we have is greater than what we need to have, than it is to spend time defining precisely what we have.

Example 1 – Hotdog Finger



Solution Path:
Solve for ∝, the ultimate inability to fly within the constrained time, in the tree such that β (the value at the Heal Time Delay node) equals the value of the Scrap and Rebook Road Trip node. You may use Swanson's Mean Approximation Method to aggregate the three "Set to fly?" branches (.3*(P10+P90)+.4*P50).

If the probability of not having valid reservation or being able to fly (∝) is ≥ 79%, scrap the vacation, pay the penalty and rebook later.

You have a medical history of a condition that prevents you from flying (**Hotdog Finger**). You don't know when the condition will flair up but when it does the 80% duration confidence interval is 18-30 hours. Unfortunately, you have no guarantee that the exclusive resort you booked is willing to hold your reservations. Vacation preparation stress tends to bring on Hotdog Finger flair-ups.

If you suffer a flair-up, you have the option of scrapping your vacation and rebooking a road trip at significant expense or waiting to see if you can recover and fly.

What should you do?

Solution: First, stop worrying about the precise probability of not being able to fly after your delay. The precise number may not matter if it is far from the indifference point. What we want to do is to calculate the indifference probability by balancing the cost outcomes by changing ∝ .

We find that the outcome values balance at a probability of reservation loss of 79%. You feel this probability is far higher than you would expect so you confidently make the decision to wait for your hotdog finger to settle down.

More than the Mean matters

The next step in coaching the team recognizes the penalty of making a regrettable decision, or the threat assessment. They should be asked "What if you are wrong?" and facilitate a sound Pre-Mortem. The assessment of the pain of being wrong starts at the maximum benefit of VoI, the indifference point. This pain will be asymmetric to the indifference point, it will cost more to be wrong in one direction than it will in the other.

They may identify conditions that prevent minimum required **Objective Fulfillment**. Did you do a good **Objectives Hierarchy**? No? Shame on you.

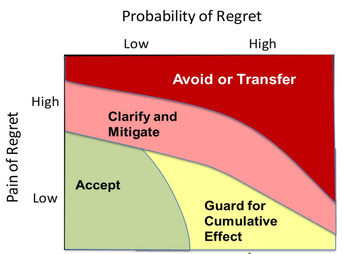
Up to now we have looked at just the Expected Value for the indifference Assessment. While that can provide great incite and confidence, there is a check you must do…

Is there a downside threat that interferes with project objectives? An unmitigatable risk that must be avoided?

Is that threat material? If Hotdog Finger in flight results in the loss of a finger or simply "mustard nails" for a month or so, the sensitivity to being wrong is heightened.

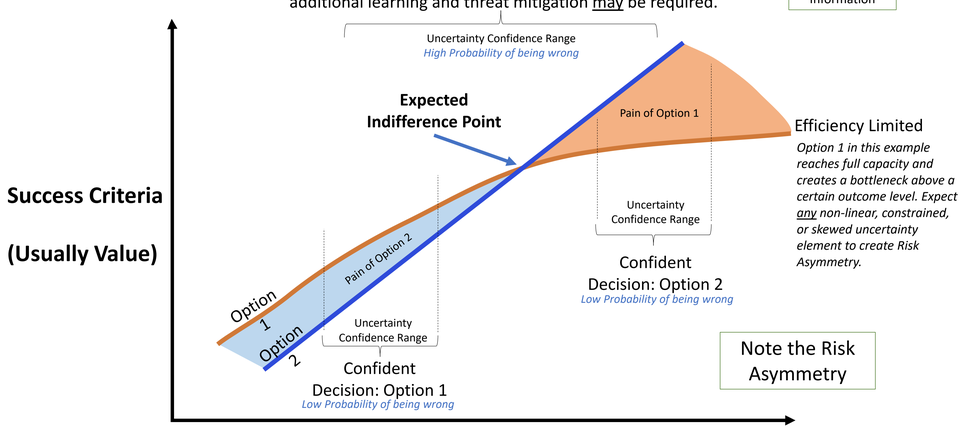
You may *think* you are indifferent, but are you really?

What is the potential Pain and Regret of making the regrettable choice?



Assess Value of Information

Unconfident Decision: Irrespective of Mean location, additional learning and threat mitigation may be required.

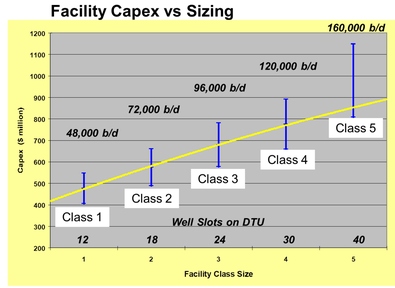


Understanding where and why your decision changes is critically important.

Multiple Indifference points

There may be several indifference points across an uncertainty distribution particularly in the context of facility or equipment sizing. When we take throughput and cost into consideration, it becomes obvious that the transition across a step change will have an outcome range that may be inefficient for both cost and throughput. There may be a significant cost difference between the two paths that creates a decrease in value. You are willing to be inefficient through a small section of the outcome uncertainty until the cost of the change is fully recovered.

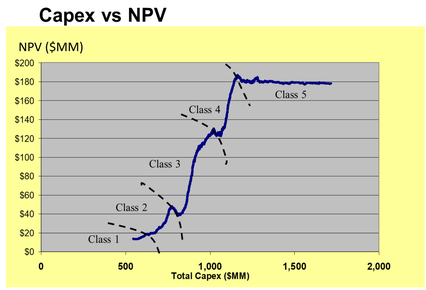
Real Example: Based on total production and Value, what size facility should we build?



Across a range of reserves the team recognized 5 different facility sizes.

DTU = Dry Tree Unit
A DTU is an offshore facility where there is direct access to producing wells, without having to go into the water. Build them big or build them small. It is a big decision what is best for the project.

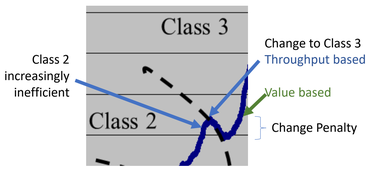
Image Source: Journal of Petroleum Technology, 31 AUG 2013



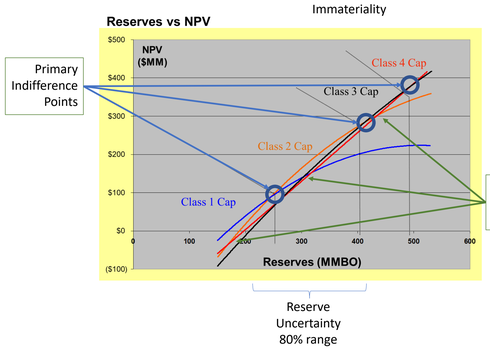
They examined the CAPEX vs NPV relationship and found that the simulation results grouped into 5 separate zones representative of the facility sizes.

At each transition there was a dip in the NPV due to one size facility reaching capacity and the next size not being efficient enough (yet) to overcome the CAPEX transition costs.

They also found that their "favorite", the huge Class 5 facility that was planned to handle peak rates, contributed any value above what a full Class 4 facility could provide. The Class 5 option could be confidently eliminated.



Indifference can vary depending on the metric



As they assessed the indifference points they noted that a Class 2 facility was optimal the majority of the time (through the uncertainty).

Of equal importance was the assessment that the penalty for building too small on the up side was less than an over build on the downside.

The early decision was made to proceed with a Class 2 facility shaving 2 years off the front-end design and reducing capital investment by nearly $900MM.

Behavioral Tip…

At both the team and management levels, people may require coaching ("un-freezing") to loosen their grip on the desire for a precise forecast. This is greatly aided by them recognizing how far away the precise expected result is from the point at which they would prefer a decision change.

Ask this and assess the probability of their condition occurring:

What would it take for you to prefer an alternate solution?