# Reasoned Decision Making Without Math? Adaptability and Robustness in Response to Surprise

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## Criteria for “Good” Decisions Under Risk

1. The decision should be based on current assets.
2. It should be based on the possible consequences of all possible outcomes.
3. The consequences should have a complete preference ordering, and each possible outcome must have a known probability of occurring.
4. The decision should maximize the resulting expected utility.

## Criteria for "Good" Decisions Under Ignorance?

1. Current assets may be incompletely known.
2. The set of possible outcomes may be incompletely known.
3. The consequences of even known outcomes may be incompletely known .
4. Even the known consequences may have an incomplete preference ordering, or unknown preferences.
5. Even a known outcome may have an unknown probability of occurring.
6. There may be no expected utility to be calculated, let alone maximized. In fact, optimization on the basis of current knowledge may be a bad idea.

## Cognitive Biases Under Ignorance

1. Confirmation Bias: The tendency to seek out and pay more attention to information that confirms what we already believe, and to ignore or sceptically discount disconfirming information.
2. Catch-All-Underestimation Bias: The tendency to under-estimate the likelihood of novel events.
3. Indecision Under Ignorance Bias: The intuition that the greater the scope of unknowns, the stronger the case for delaying decisions or actions.

Without militating against these biases, humans are prone to over-confidence about the completeness of their knowledge and the predictability of the future, and to inaction in the face of unknowns.

## Methodological Rules Under Ignorance

1. The quality of outcome that can be guaranteed gets worse as the scope of unknowns increases.
2. The rank-ordering of the quality of outcomes becomes increasingly unreliable as the scope of unknowns increases.

Therefore, any procedure that is not robust against unacceptable outcomes and/or depends on a stable preference structure is potentially brittle under ignorance.

Are there any alternative guidelines for decision-making under ignorance?

## Criteria for (Known) Alternatives

1. Consider alternatives as assets or liabilities. Be cautious about foreclosing irrecoverable alternatives.
2. Retain sufficiently many alternatives to avoid conflicts between outcome preferences.
3. Give high priority to alternatives that are unlikely to yield unacceptable outcomes under a wide variety of futures.
4. Give high priority to steerable or corrigible alternatives over those that lead to irreversible, fixed outcomes.
5. Give high priority to alternatives that yield observable outcomes in the short term over those whose outcomes are unobservable, or observable only in the long run.
6. Give low priority to alternatives that produce sunk costs, high transition or transaction costs, unobservable outcomes, or that eliminate other desirable alternatives.

# Combating Cognitive Biases

1. Against confirmation bias:
    1. Try negative test-search strategies
    2. Consult with people you respect whose viewpoints and/or backgrounds differ from yours and who are likely to disagree with you
2. Against catch-all-underestimation bias:
    1. Use wisdom-of-crowds approaches, using individuals who vary in outlooks and backgrounds
    2. After building future projections with one team, bring in another team and reward them for effectively crashing the first team's projections and strategies
3. Against inaction in the face of unknowns:
    1. Take measures against decision avoidance
    2. Try not to fall prey to "paralysis by analysis"

## How Can We Get Good Ideas?

A state of ignorance also often is a “stuck” state.

Are there any strategies or tactics that can increase the likelihood that we’ll get “unstuck”?

What Enables Discoverers to Make Discoveries?

- “Pasteur Principle”: Having the depth of expertise to be able to interpret novel, unexpected events.
- “Exaptation Principle”: Hijacking something from outside your domain and adapting it to new purposes.

# How Can We Get Good Ideas?

What Strategies Generate (Good) Discoveries?

- “Kettering Principle”: Novel events are elicited by active curiosity and play.
- “Disraeli Principle”: Novel events elicited by novel actions and experiments.
- “Delbruck Principle”: Dare to err; be sloppy enough that the unexpected occurs, but not so sloppy as to be unable to understand it.
- “Berners-Lee Principle”: Slow hunches are more likely to pay off than fast hunches.
- “Poincaré Principle”: Know when to give up, and when to return to a problem.

## How Can We Get Good Ideas?

Where Do Discoveries Happen?

- "Merton Principle": Most discoveries get made simultaneously in multiple places.
- "Dunbar Principle": Discoveries are most likely to arise as a result of discussion and debate.
- "Campbell Principle": Too much agreement among scholars or researchers results in complacency and stagnation.
- "Coffeehouse Principle": Cross-fertilization arises from meeting-places and events that bring people from diverse backgrounds together in discussion.
- "Tenure Principle": Trust-based relations are more likely to generate creative ideas than contract-based or bureaucratically-regulated relations.

# *Thanks!*

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