Integrated Decision Management

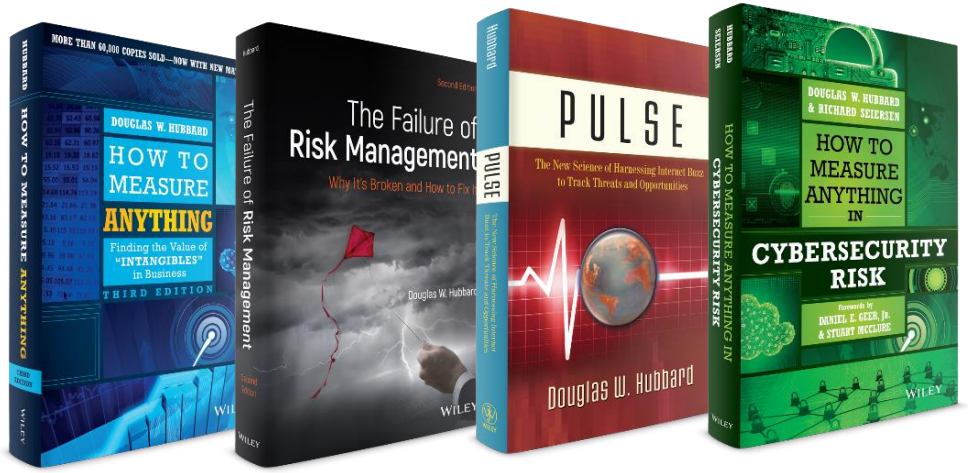
Doug Hubbard

RISK AWARENESS WEEK 2022

Hubbard Decision Research Background

In 200+ major analysis projects, HDR has been able to show that no matter how difficult the measurement and monetization problem appears to be, we find a way to evaluate it and communicate the results.

- The benefits and risks of ***dams on the Mekong River***
- Risks and benefits of ***Environmental policy*** for US farmers
- The benefits of ***Educational assistance*** in inner city schools
- The benefits of roads, schools and hospitals in Haiti and how to prioritize them for the ***United Nations***
- The relative value of ***R&D portfolios*** in aerospace, biotech, and pharma
- ***Logistics forecasts for the battlefield*** and the effectiveness of training for the US Military



My Thesis

Hubbard Decision Research

Risk informs decisions but it not the only part of decision making.

The entire world of decision-making methods goes well beyond what is typically within Risk Management – and it is disconnected from these processes and methods.

The problem isn't just Risk Management, but everything that is supposed to support decisions.

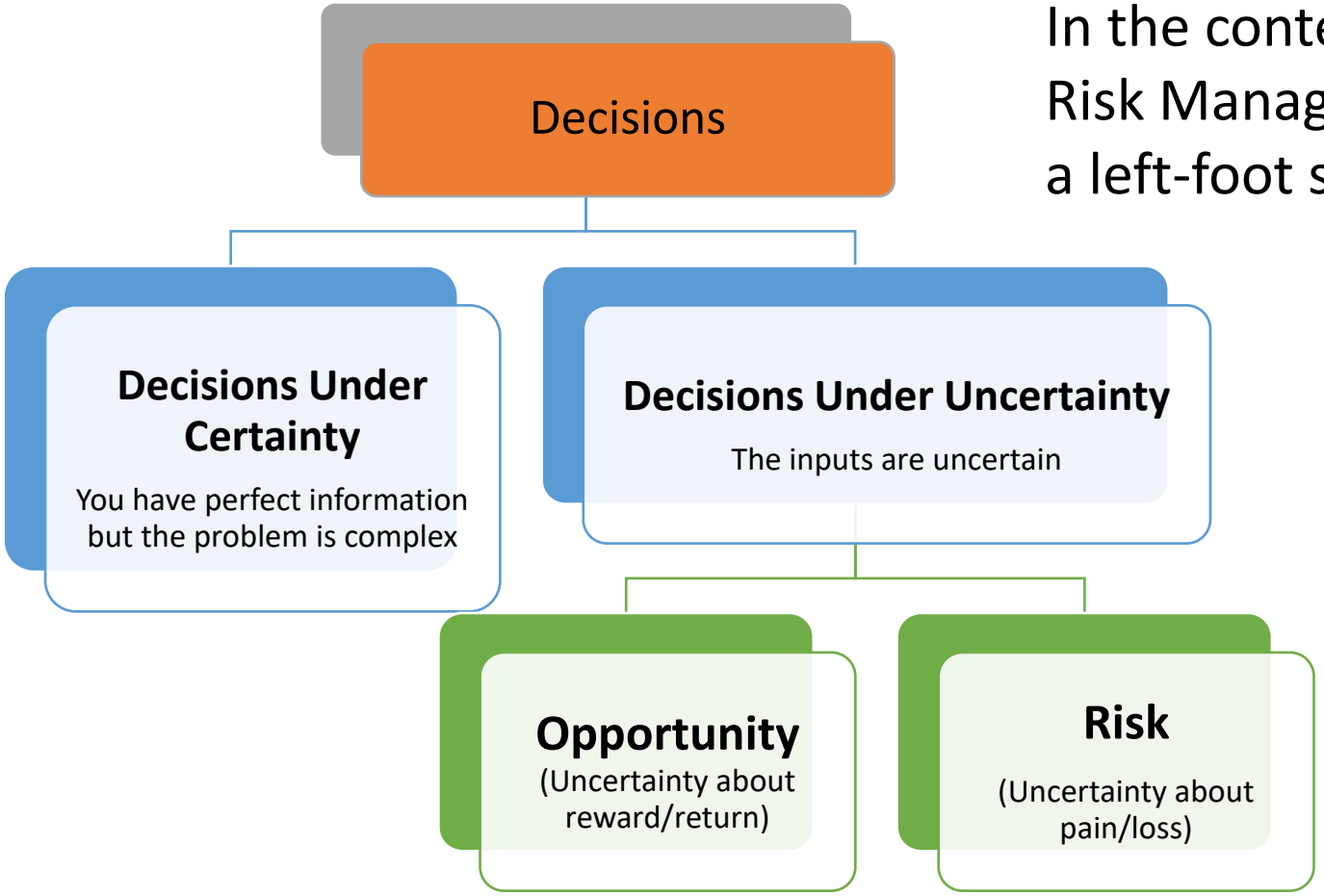
Some Questions From Risk Management

- How big should an event be to classify as a risk?
- How uncertain should the loss be?
- Is not meeting an ambitious goal a “risk”, even if being short of it is not a loss?
- Where do we assess how much more risk is acceptable given a higher return?

Questions like these are only issues if we think of risk management as separated from the larger topic of managing decision making.

Some definitions of risk confuse risk with opportunity

Risk vs. Opportunity in Decision Making



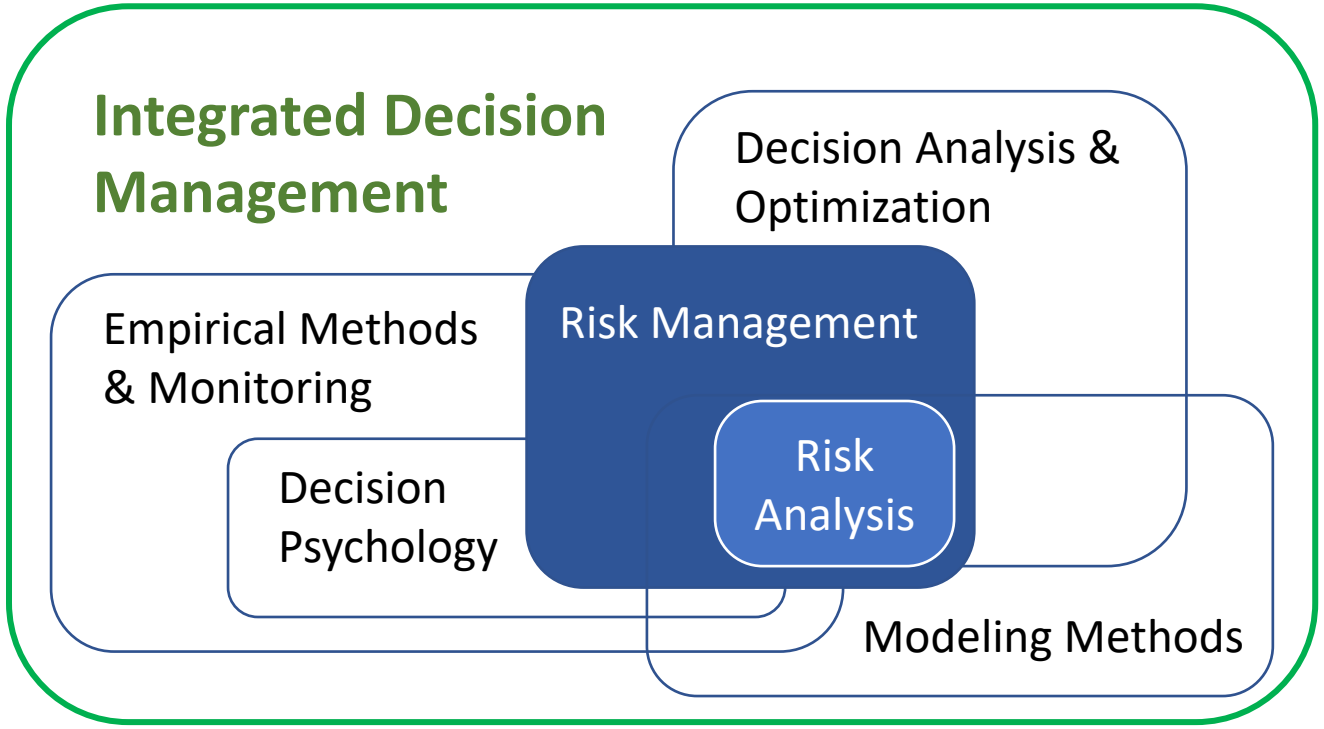
In the context of broader decision making, Risk Management makes as much sense as a left-foot shoe department.

I realize some definitions of risk management include ALL uncertainties, but that is not a universal use of the term, it's an unnecessary use of the term, and it is inconsistent with previous definitions and quantitative methods.

Definitions that try to combine Risk and Opportunity only further distance RM from the rest of decision making.

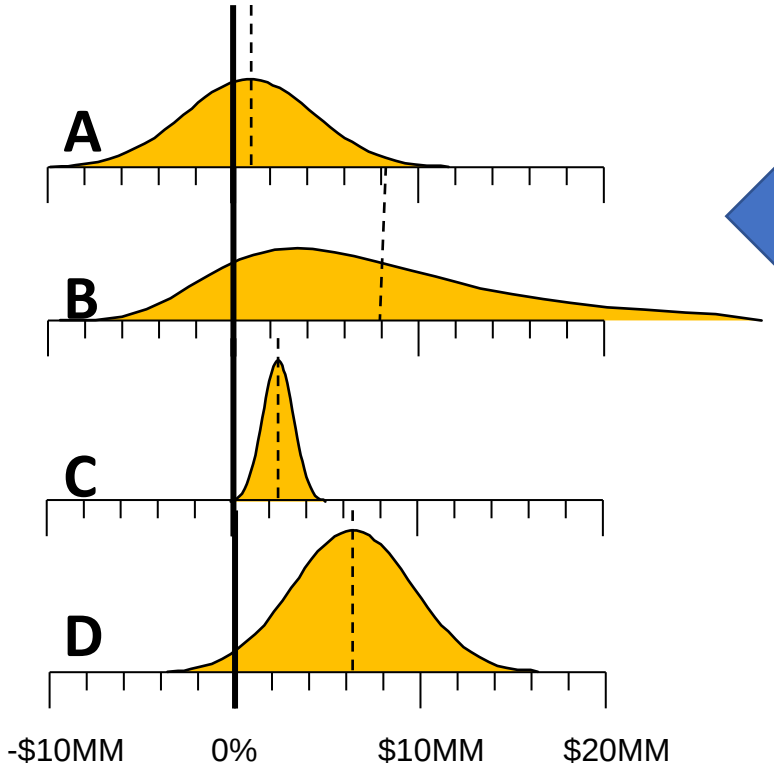
Getting Closer To The Whole Solution

Risk Management is one part of a much larger system required for making informed decisions.



Risk vs. Return in Decision Making

Distribution of Net Benefit for Various Initiatives:

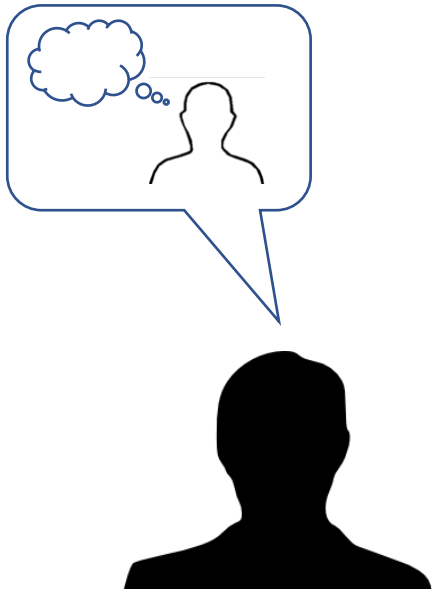


In isolation, risk management is not about how we should select and prioritize investments, how we should track their performance or about the methods used to make those decisions.

The Psychology of Risk Aversion

Hubbard Decision Research

Decision makers are also inconsistent regarding their own aversion to risk.



Neuron Vol. 47, (2005): 763–770

The Neural Basis of Financial Risk Taking

Camelia M. Kuhnen and Brian Knutson

Journal of Personality and Social Psychology
2001, Vol. 81, No. 1, 146–159

Copyright 2001 by the American Psychological Association, Inc.
0022-3514/01/$5.00 DOI: 10.1037//0022-3514.81.1.146

Fear, Anger, and Risk

Jennifer S. Lerner
Carnegie Mellon University

Dacher Keltner
University of California, Berkeley

Factor	Risk Aversion
Being around smiling people	↓
Recalling an event causing fear	↑
Recalling an event causing anger	↓
A recent win in an unrelated decision	↓
A recent loss in an unrelated decision	↑

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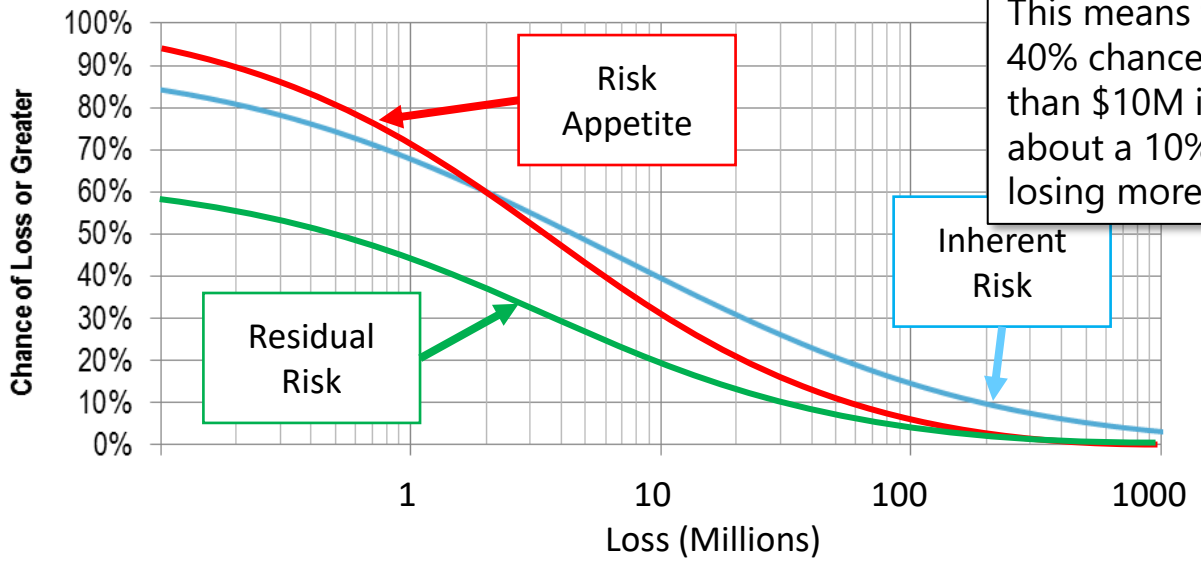
A Version of Risk Tolerance: The Loss Exceedance Curve

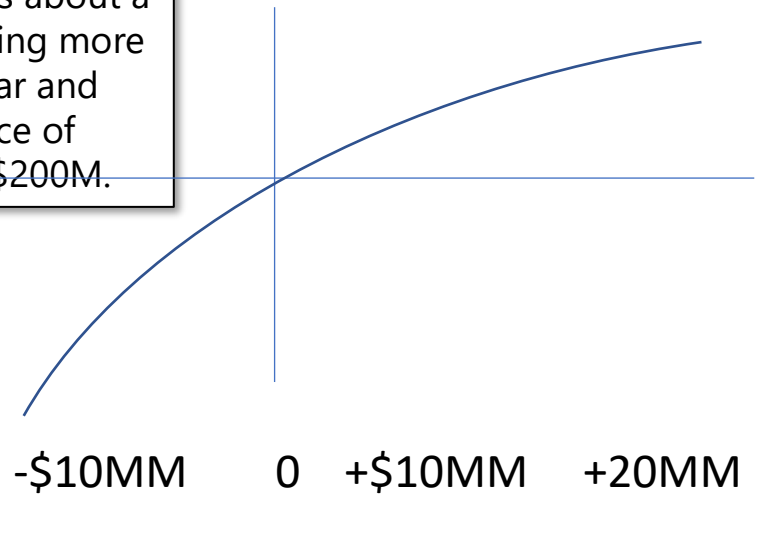
Explicitly stating risk tolerance is a key part of a decision and cannot be excluded from dashboard-informed decisions.

Loss Exceedance Curve



This means there is about a 40% chance of losing more than $10M in a year and about a 10% chance of losing more than $200M.

Utility



Utility Theory

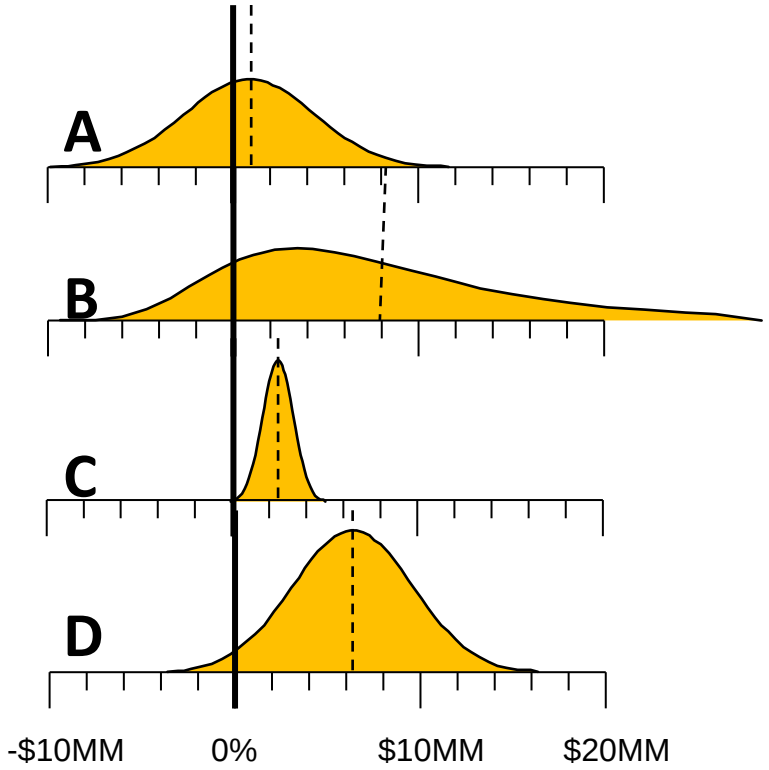
Expected Utility Theory is the most quantitatively sound method for describing risk preferences. It is the basis of the field of Decision Analysis and is widely used in portfolio management and actuarial science.

It is based on the idea that in order for risk preferences to be consistent, they should be guided by the probability-weighted average utility of choices.

There is a whole set of mathematics showing functions that describe expected utility in ways that can't violate basic common sense about preferences.

Risk vs. Return in Decision Making

Distribution of Net Benefit for Various Initiatives:



To prioritize actions with uncertain net benefits like these, we need to compare them on a single dimension, like "Certain Monetary Equivalent" (CME)

All it takes is a few preferences stated in terms of bets.

We can ask two or three questions like "If you had a bet with a binary outcome, where there was a 60% chance of winning $10MM but a 40% chance of loss, how large of a loss would be just barely acceptable?"

Dis-integrated Decision Making

Can we manage all of this in a more cohesive way?

The Analysis Placebo

Organizational Behavior and Human Decision Processes
107, no. 2 (2008): 97– 105.

Journal of Behavioral Decision Making 3, no. 3 (July/ September 1990): 153– 174.

Law and Human Behavior 23 (1999): 499– 516.

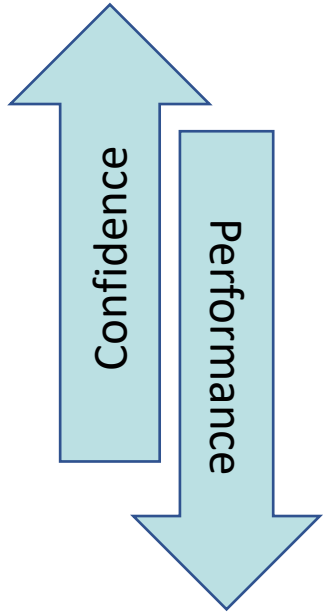
Organizational Behavior and Human Decision Processes 61, no. 3 (1995): 305– 326.

Interaction with Others Increases Decision Confidence but Not Decision Quality: Evidence against Information Collection Views of Interactive Decision Making

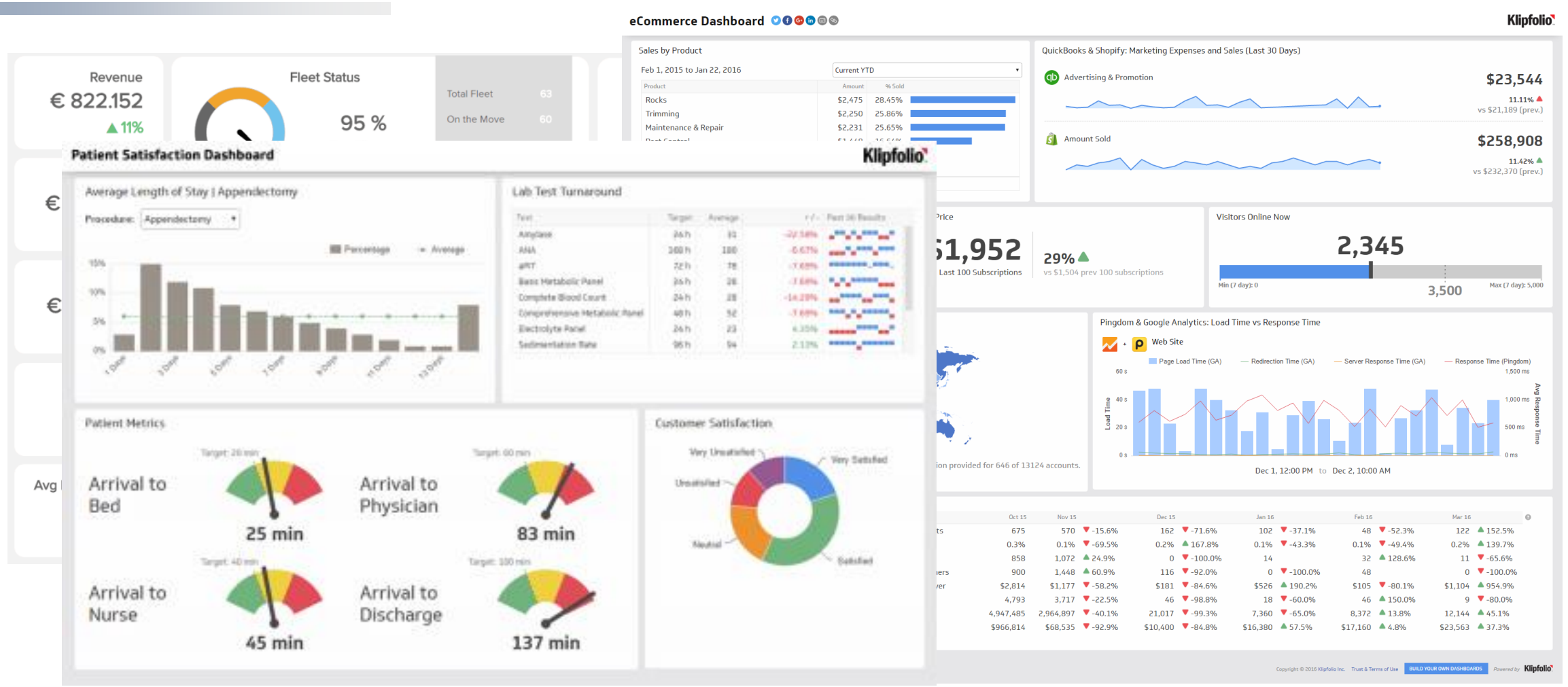
Heath and Gonzalez

Abstract

We present three studies of *interactive decision making,* where decision makers interact with others before making a final decision alone. Because the theories of lay observers and social psychologists emphasize the role of information collection in interaction, we developed a series



Examples of “Typical” Dashboards



Hope is Not a Strategy

Are you counting on a **“Dashboard Epiphany”** for important decisions?

- Are you confident you will “know it when you see it?”
- Are you considering multiple interacting conditions?
- Are you forecasting from those conditions the net benefit of different actions at different times?

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Are Dashboards & Metrics Driven By Information Value?

The economic value of measuring a variable is usually inversely proportional to the measurement effort.

HDR has observed a “Measurement Inversion” in nearly every industry, profession and type of decision model we’ve every made.

The cure for starts with knowing which variables are the highest information value.

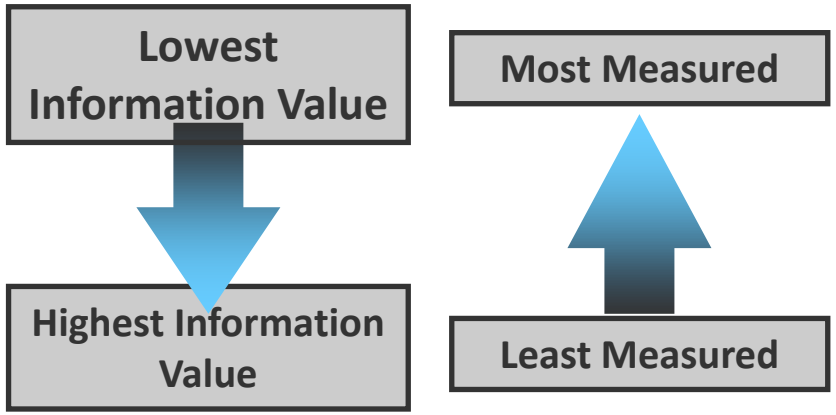
IEEE Transactions on Systems Science and Cybernetics (1966)

Information Value Theory

Ron Howard

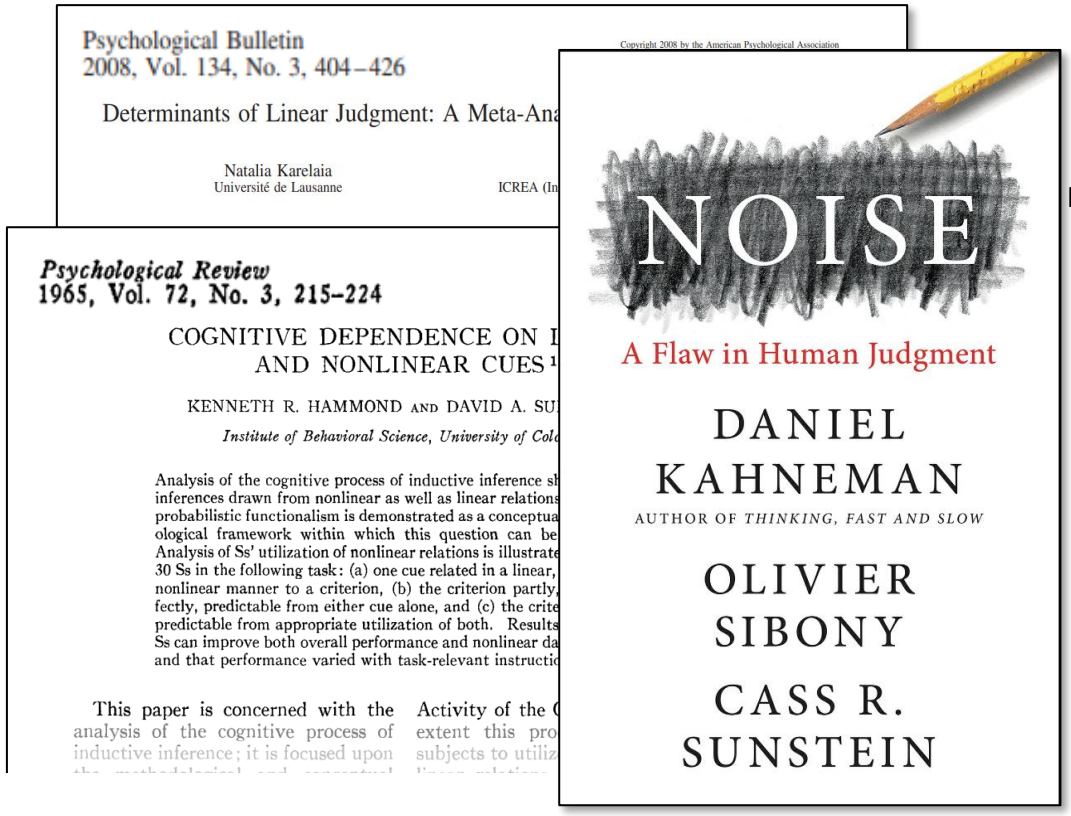
Abstract

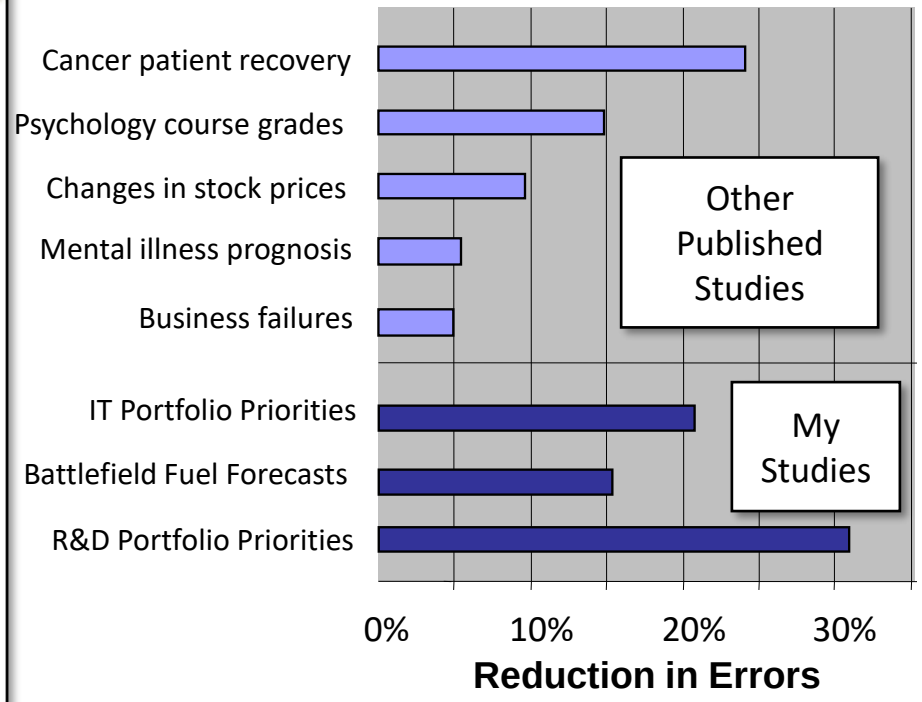
The information theory developed by Shannon was designed to place a quantitative measure on the amount of information involved in any communication. The early developers stressed that the information



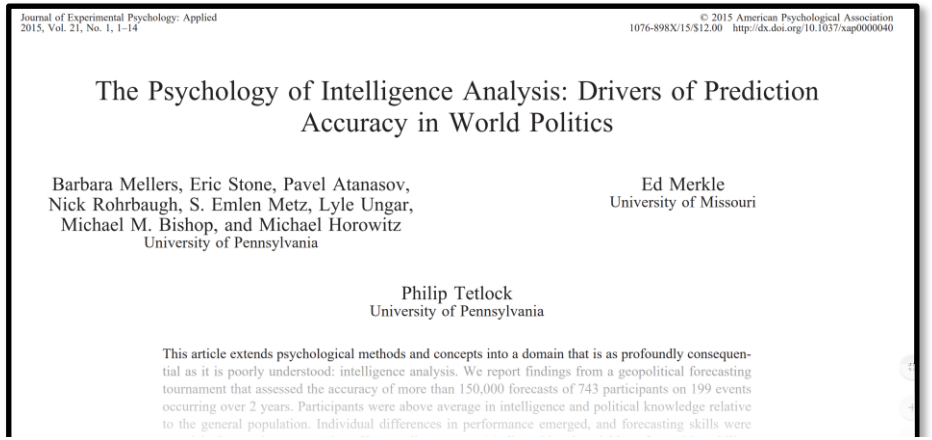
Measuring Estimate & Decision "Noise"

The "Lens Method" statistically "smooths" estimates of experts. Several studies for many different kinds of problems show it reduces judgement errors.





Teams Matter



Journal of Experimental Psychology: Applied
2015, Vol. 21, No. 1, 1–14

1076-898X/15/$12.00 http://dx.doi.org/10.1037/xap0000040

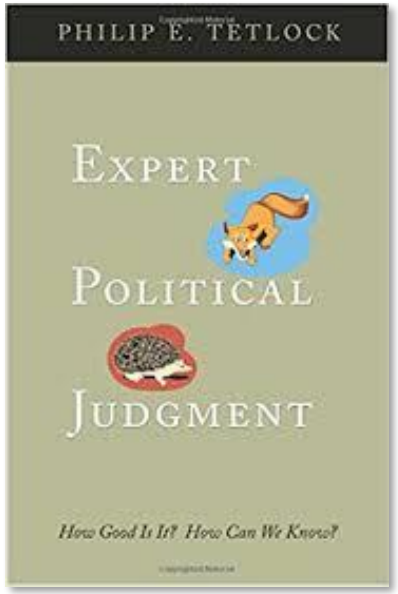
The Psychology of Intelligence Analysis: Drivers of Prediction Accuracy in World Politics

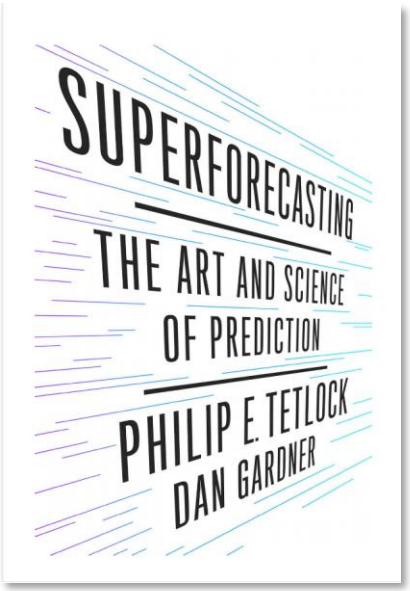
Barbara Mellers, Eric Stone, Pavel Atanasov, Nick Rohrbaugh, S. Emlen Metz, Lyle Ungar, Michael M. Bishop, and Michael Horowitz
University of Pennsylvania

Ed Merkle
University of Missouri

Philip Tetlock
University of Pennsylvania

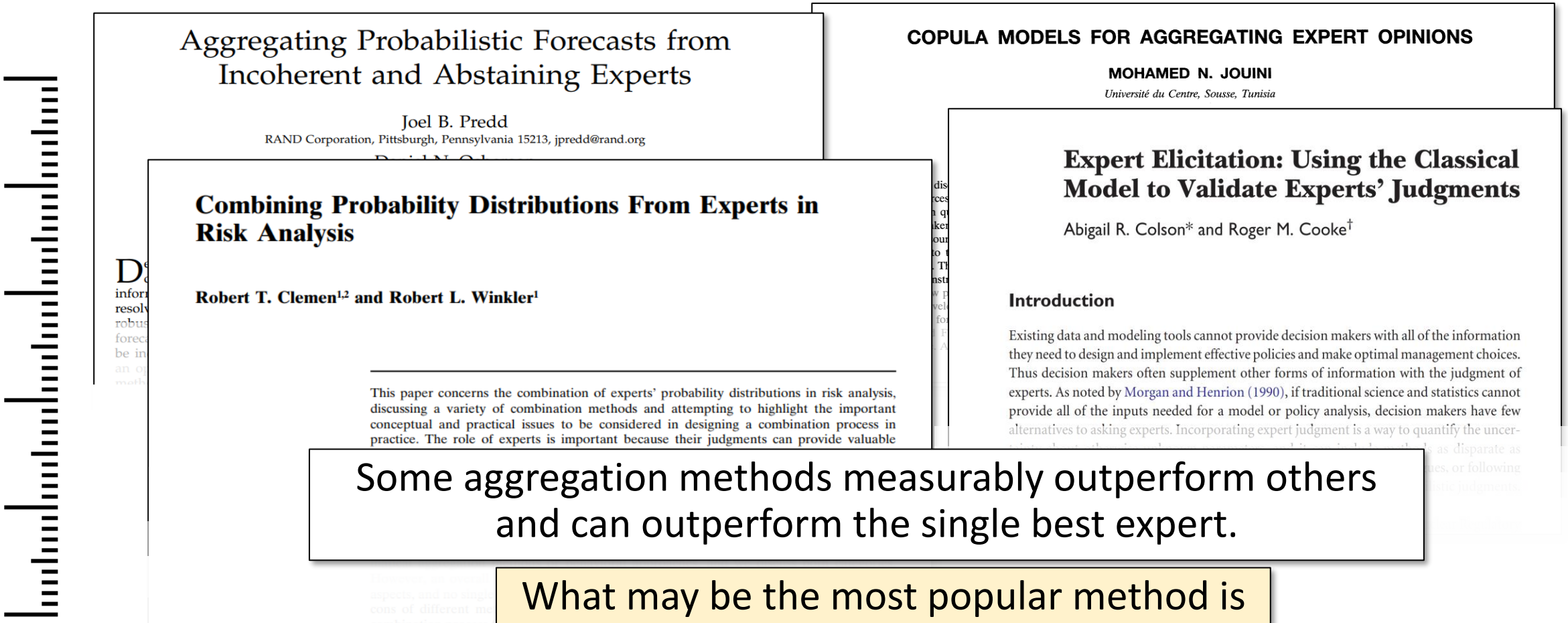
This article extends psychological methods and concepts into a domain that is as profoundly consequential as it is poorly understood: intelligence analysis. We report findings from a geopolitical forecasting tournament that assessed the accuracy of more than 150,000 forecasts of 743 participants on 199 events occurring over 2 years. Participants were above average in intelligence and political knowledge relative to the general population. Individual differences in performance emerged, and forecasting skills were





- **Training:** Subjects were trained in basic inference methods and avoiding common errors and biases.
- **Teams of "Belief Updaters":** The best teams comprise individuals were willing to update beliefs based on new information.
- **Tracking Who is Better:** Some just had a knack for it. IQ mattered (a little).

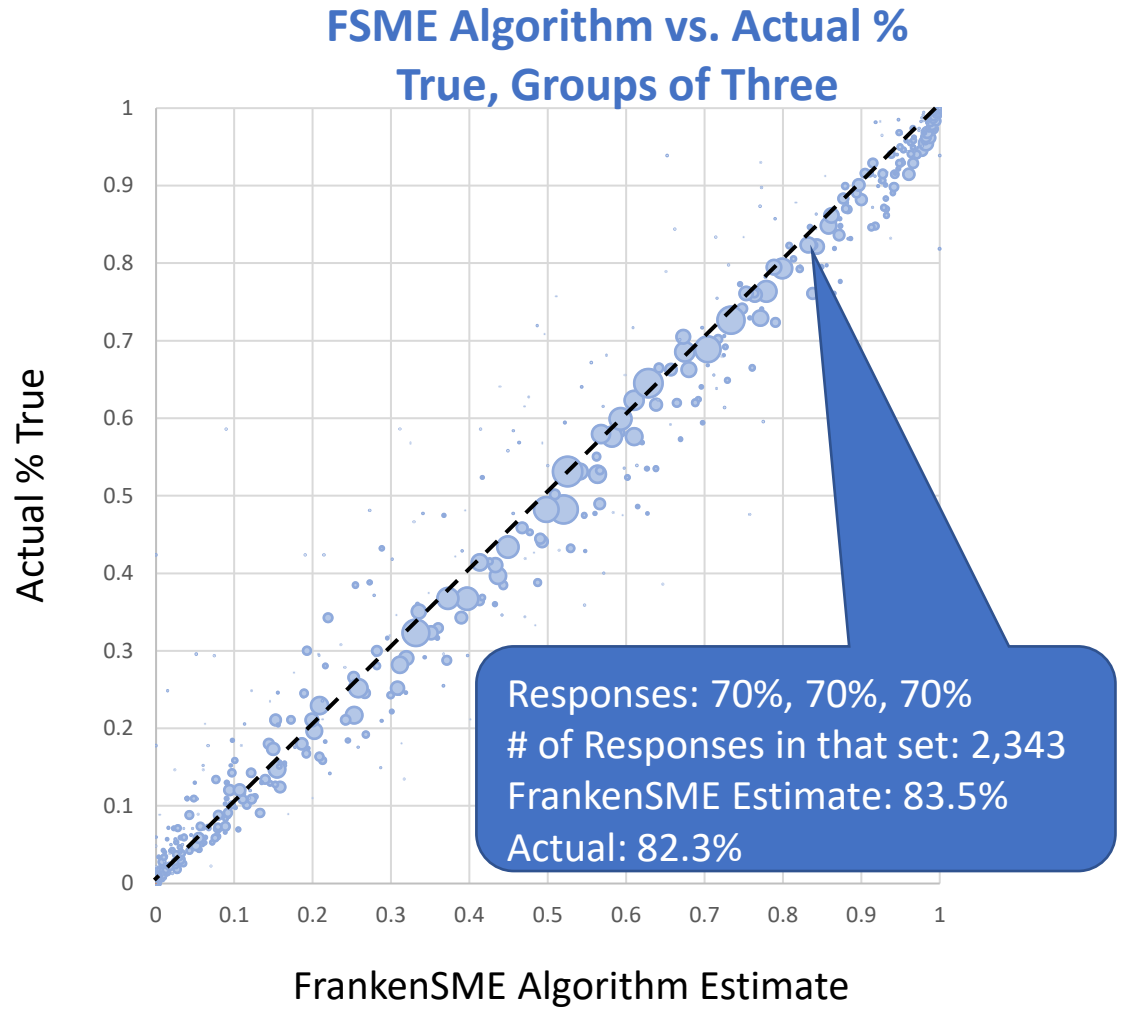
Research on Aggregating Multiple Experts



Some aggregation methods measurably outperform others and can outperform the single best expert.

What may be the most popular method is among the worst performing.

Combining SMEs: The FrankenSME



- HDR has algorithms for combining experts using data from over 60,000 responses from 577 calibrated individuals grouped into 1.7 million teams.
- The best team of two, might not be obvious. It might be your 1st an 3rd best estimator, because of how their knowledge is less correlated (more complimentary).

Tracking Estimates and Decisions Requires a Registry

- Meta-science is the application of scientific method to itself to continuously improve it.
  One issue it addresses is “publication bias.”
- One of the ideas involves a “research registry” so that *all* research findings are published, not just the ones that had positive results.
- This has a parallel in decision making and estimations – we make far more than we recall but we tend to recall when we were right.

SSI ASA SYMPOSIUM ON STATISTICAL INFERENCE
OCTOBER 11-13, 2017 BETHESDA, MARYLAND
Scientific Method for the 21st Century: A World Beyond $p < 0.05$

The American Statistician (2019)

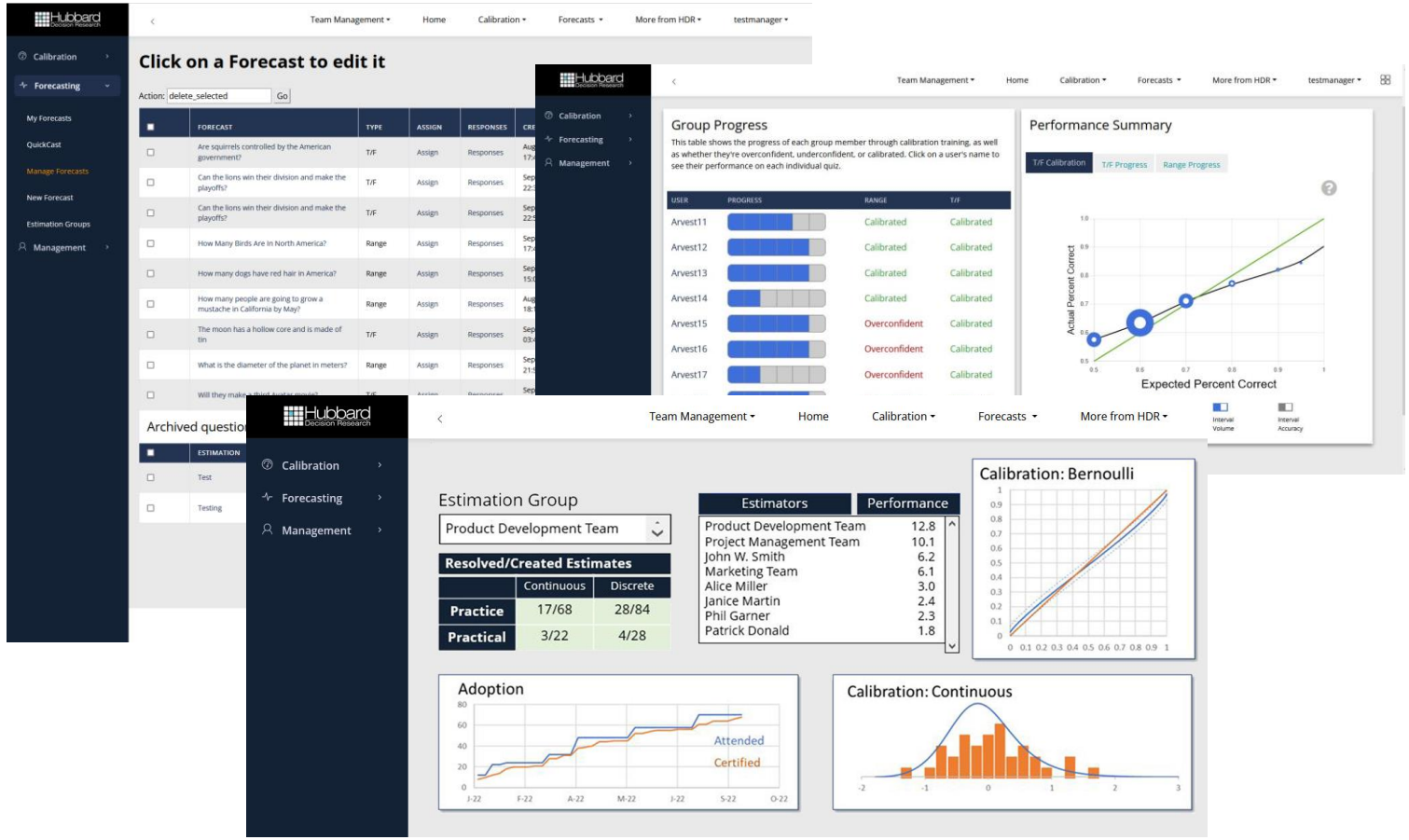
Quality Control for Scientific Research: Addressing Reproducibility, Responsiveness, and Relevance

D.W. Hubbard & A.L. Carriquiry

Abstract

Efforts to address a reproducibility crisis have generated several valid proposals for improving the quality of scientific research. We argue there is also need to address the separate but related issues of relevance and responsiveness. To address relevance,

Tracking Decisions and Estimates is Practical



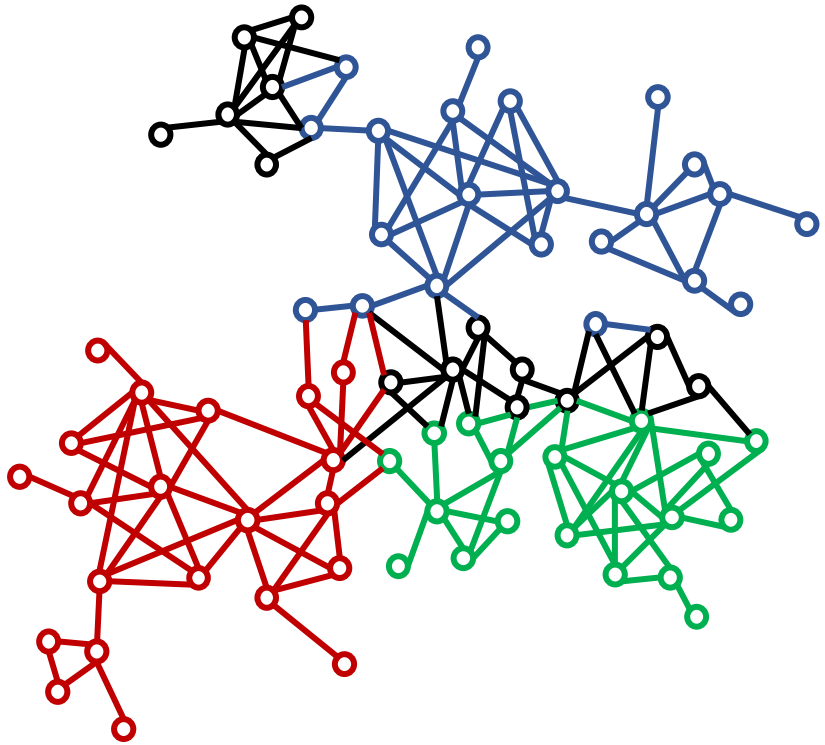
We've begun to track training, individual estimates, team estimates, and outcomes.

We can also use "practice" estimates

Aspirational Goals for Integrated Decision Management

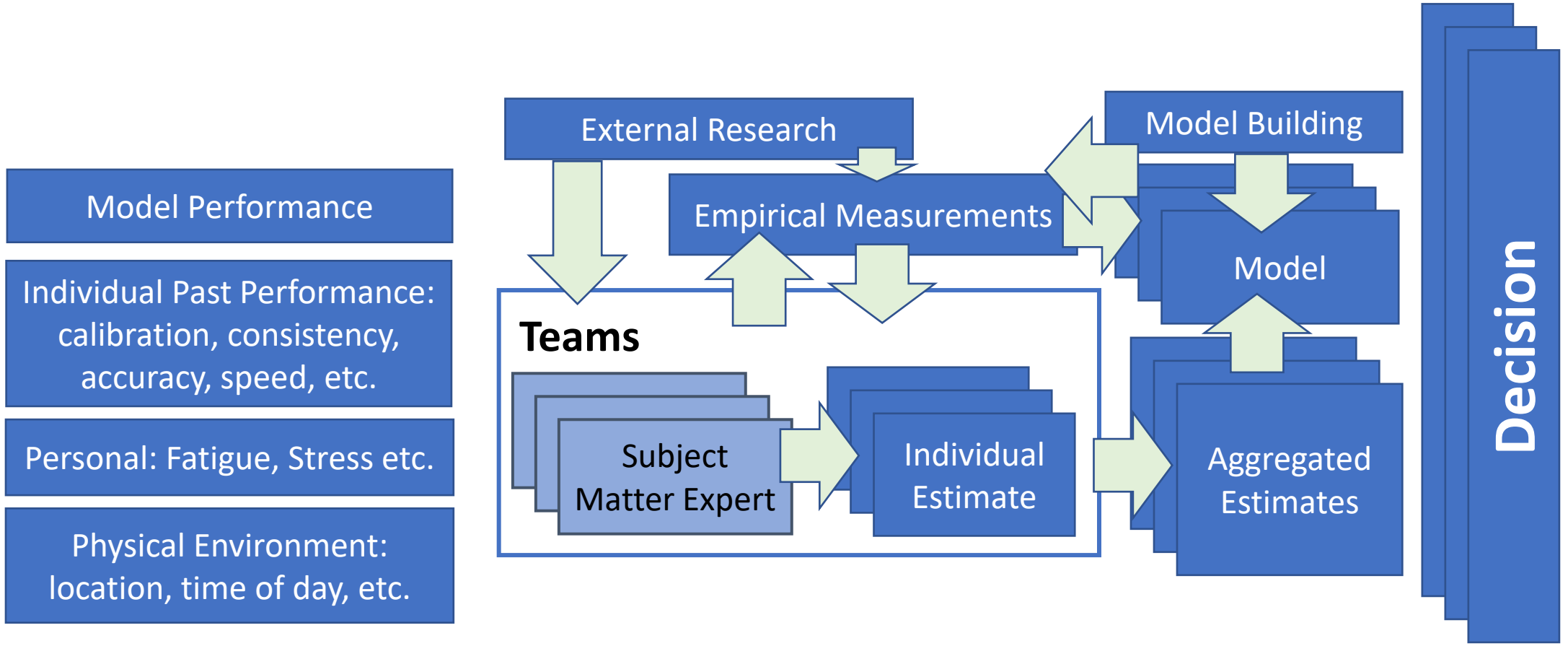
- Computational Social Science deals with how social networks influence and spread behavior.

- Social Media uses methods like this to keep you engaged, but can it also improve your performance as a decision maker or estimator?



A Decision Ecosystem

Hubbard Decision Research



Summary

Think of Risk Management as a component of a larger decision-making process.

Getting the most value out of Risk Management may involve developing the other components of decision making.

One of the first steps is starting to track the performance of SMEs, decision makers and models. Don't assume they work.

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Measure What Matters.
Make Better Decisions.