UNIVERSITY OF ARKANSAS
College of Engineering
Mechanical Engineering

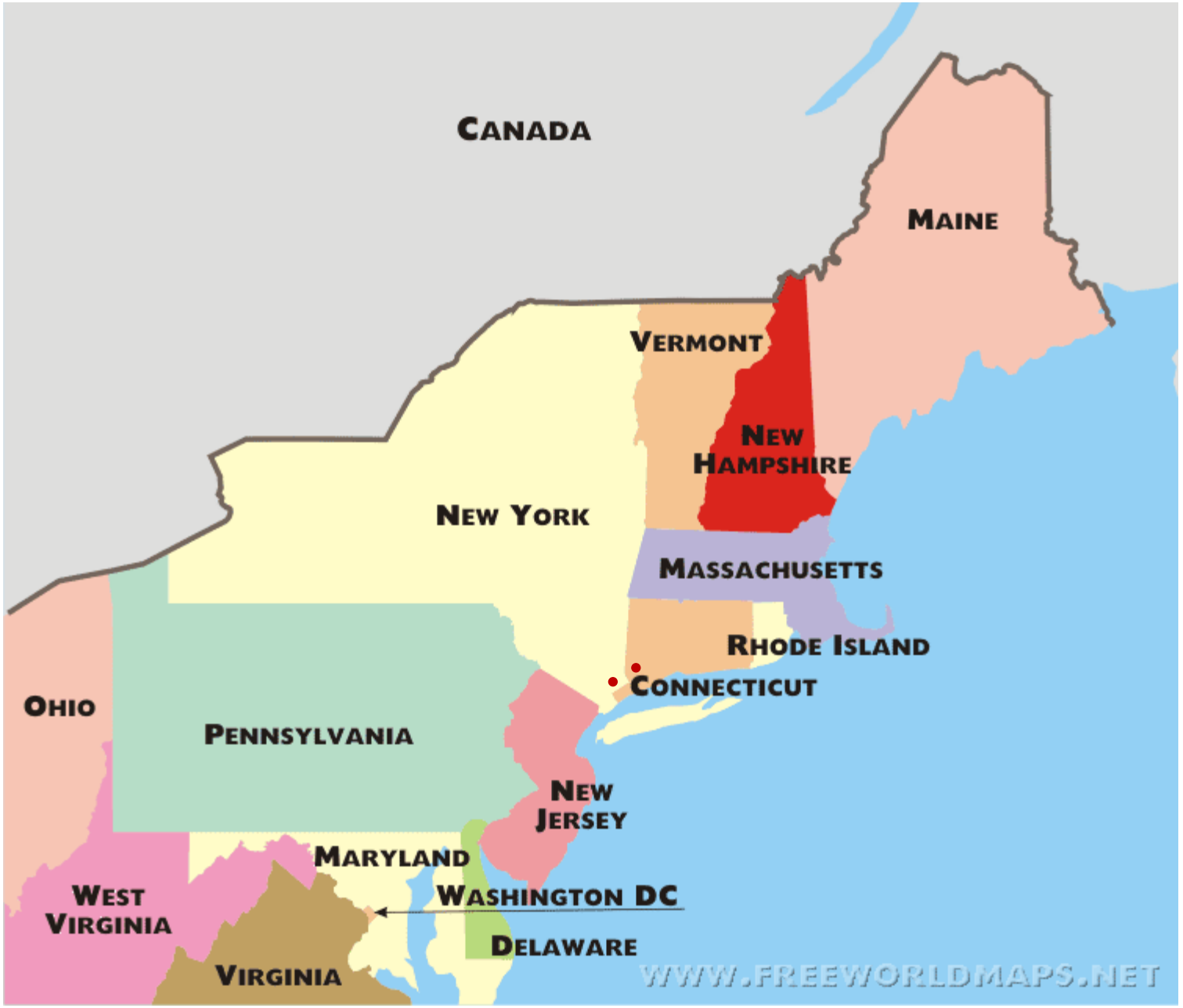
Leveraging behavioral science for sustainability and innovation

Jenn Campbell

NWA ASHRAE

May 2, 2024

Background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VERMONT
NEW HAMPSHIRE
NEW YORK
MASSACHUSETTS
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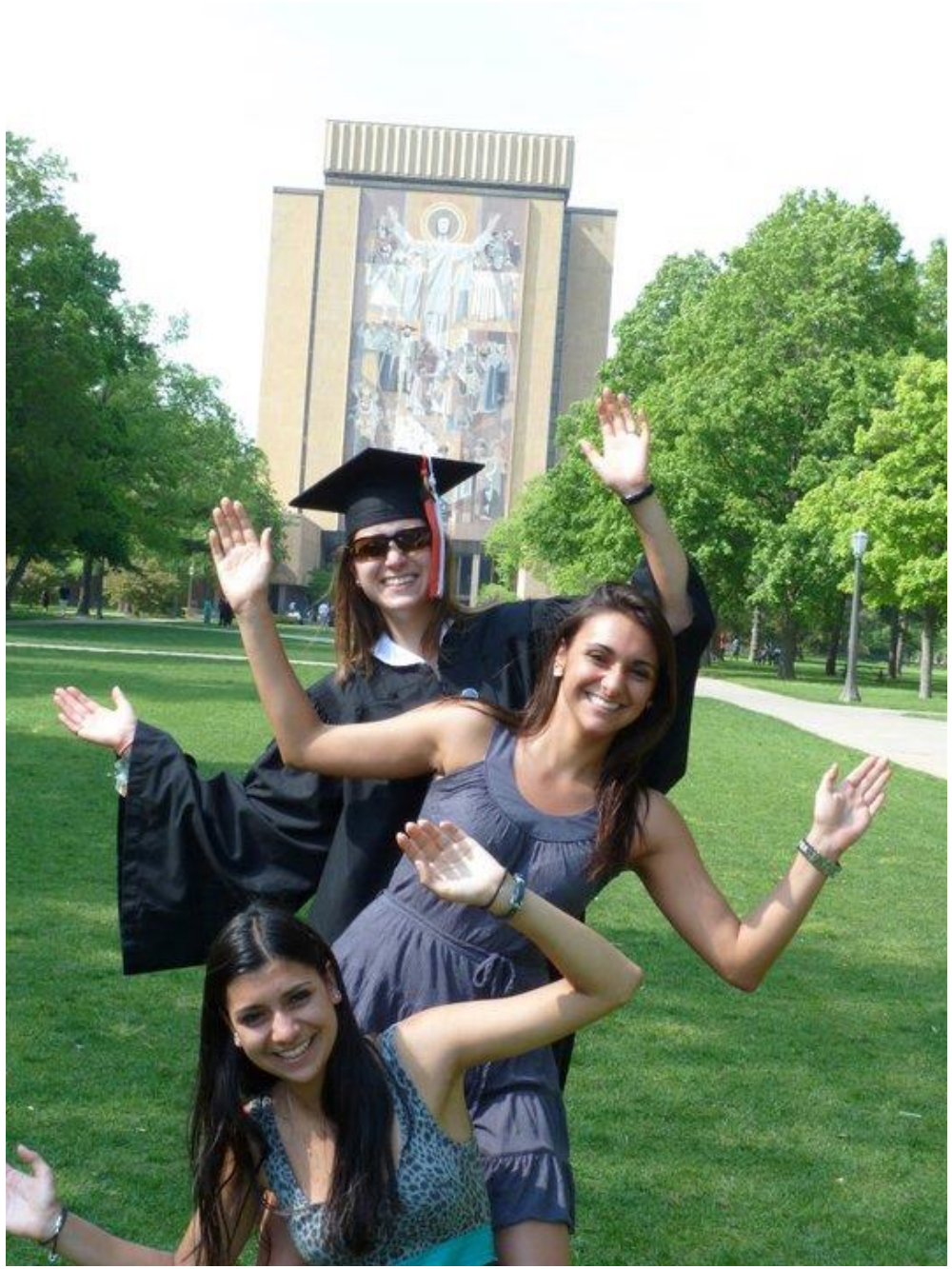


University of Notre Dame
Mechanical Engineering
Political Science

Trek Bikes
Design Engineer (6 years)
Program Manager (3 years)
2 Patents

UW-Madison
Master’s in Engineering Management

BEHAVIORAL scientist

SCIENCE

What Do Engineers and Behavioral Scientists Have to Learn From Each Other?

By **Leidy Klotz**
March 11, 2019

Image: DJ Neri

University of Virginia

PhD, Civil Engineering

University of Arkansas

Assistant Professor, Mechanical Engineering

I aim to help engineers create a more **just, inclusive, and sustainable world** by applying principles from behavioral science to the engineering design process.

Learning objectives

1. Understand what **behavioral science**, **heuristics**, and **biases** are.
2. Identify ways behavioral science shows up in our everyday lives.
3. Recognize common heuristics and biases that impact engineering decision-making.
4. Apply evidence-based strategies to leverage behavioral science for improved innovation and sustainability.
5. Reflect on the relevance of behavioral science in your role and/or organization.


People
Social
Performance
SUSTAINABILITY
Profit
Economic
Performance
Planet
Environment
Performance

What is behavioral science?

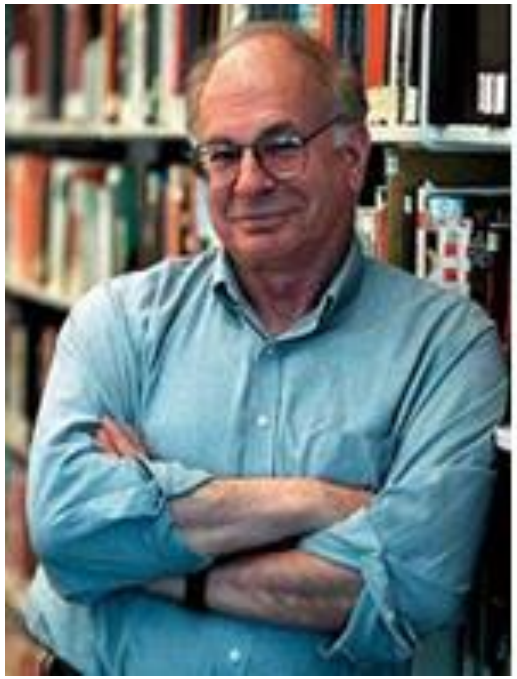
Why should you care?

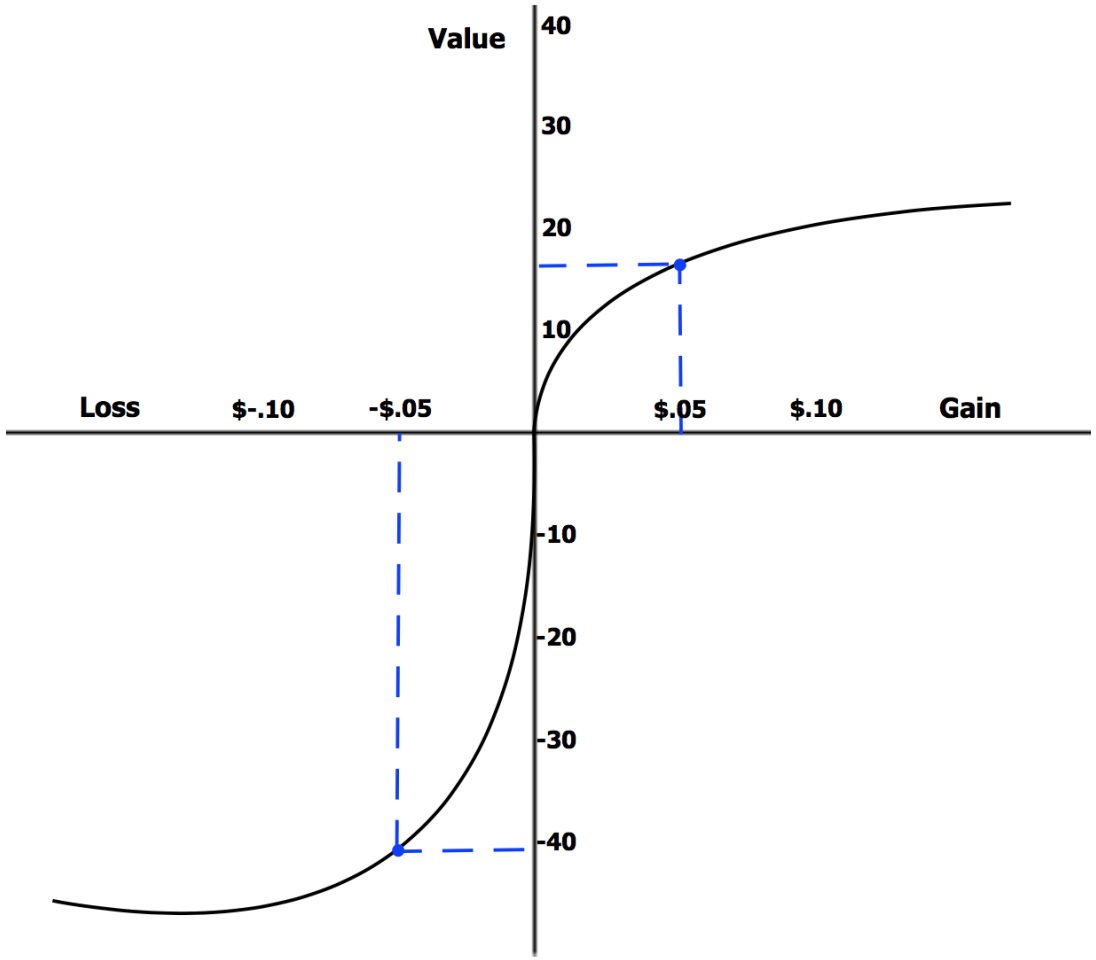
What is behavioral science?

Why should you care?

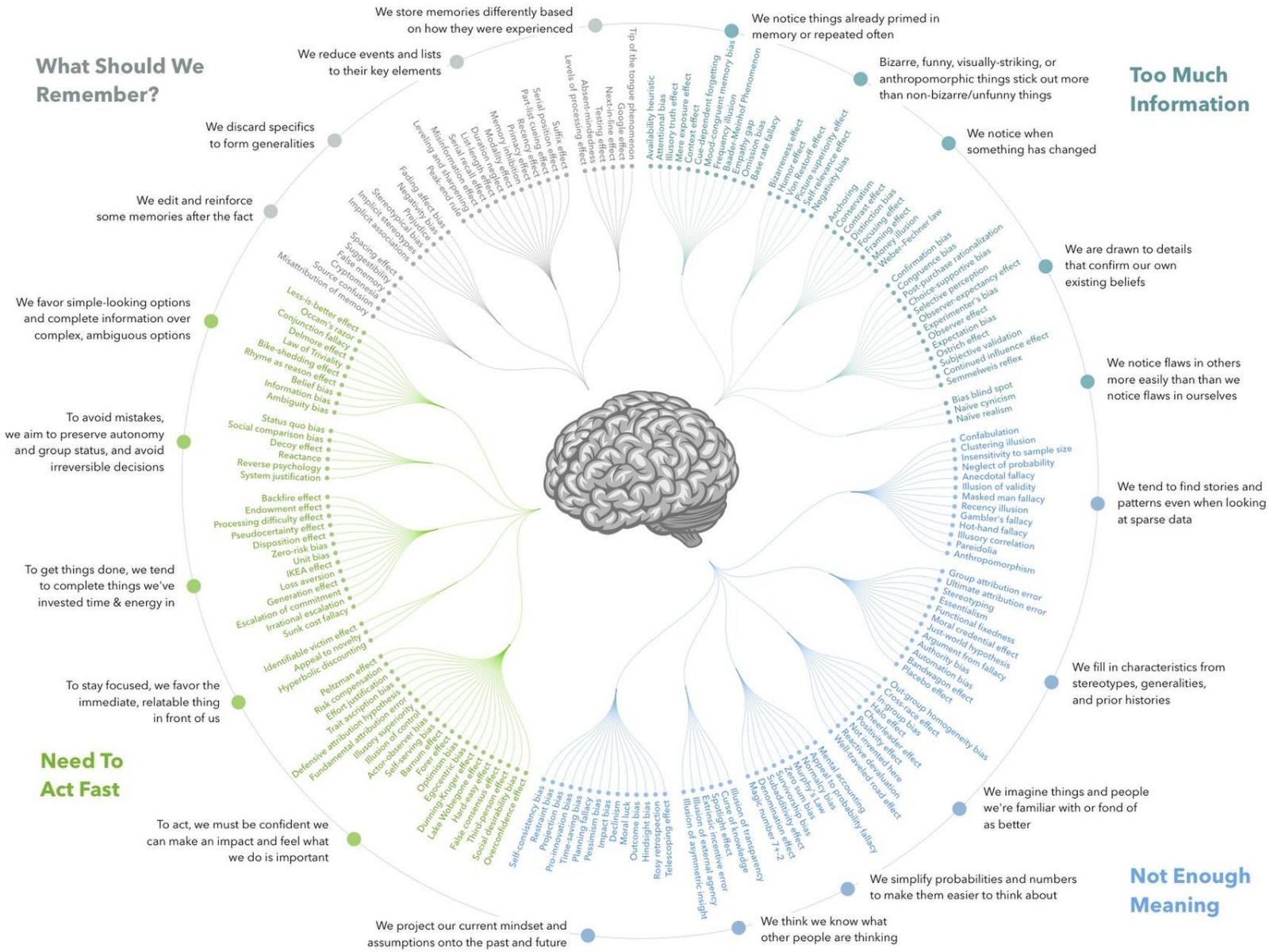
What is behavioral science?

Why should you care?

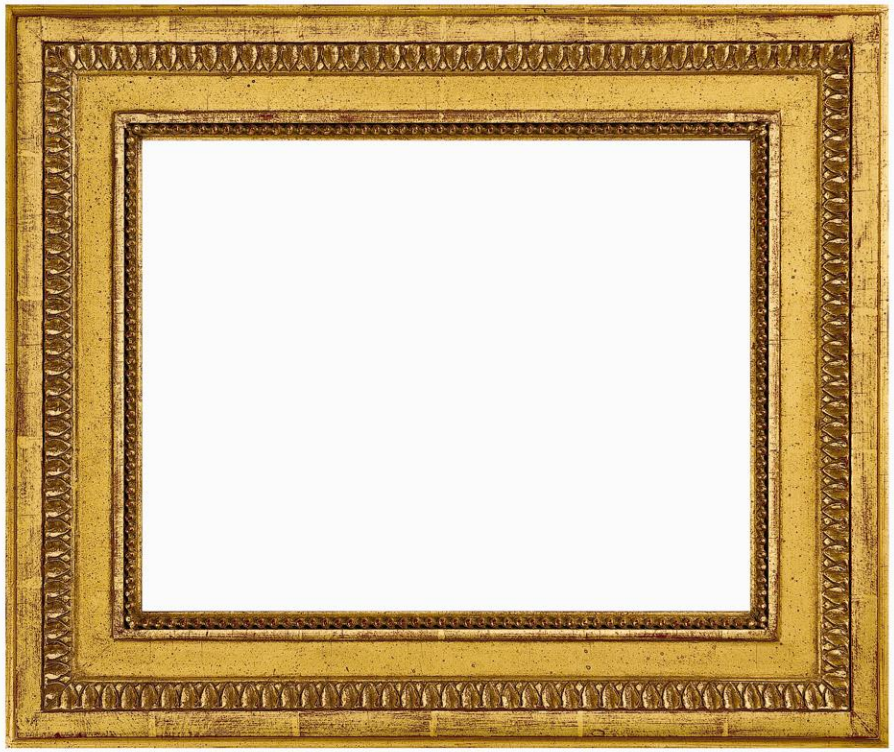




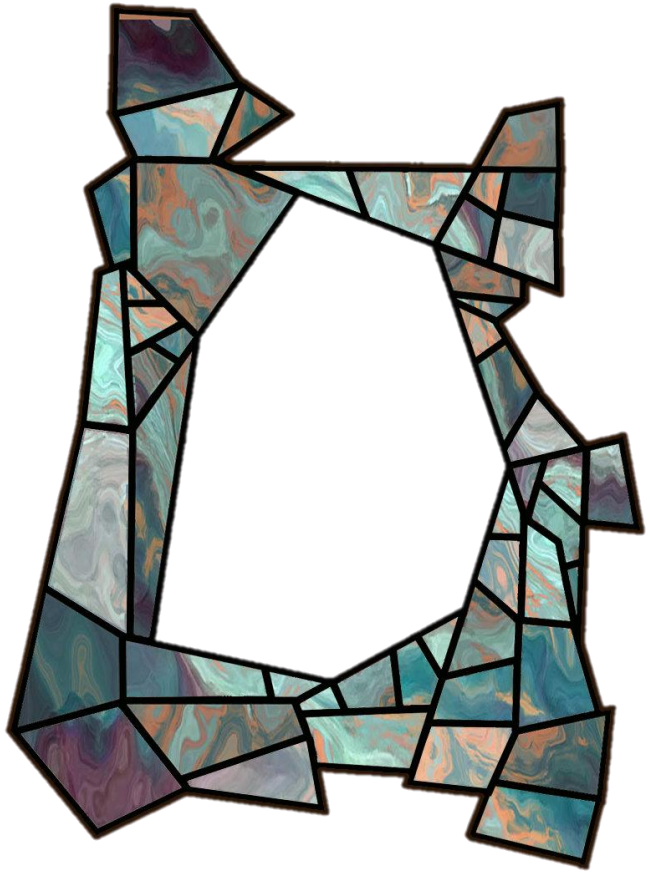
COGNITIVE BIAS CODEX



DESIGNHACKS.CO · CATEGORIZATION BY BUSTER BENSON · ALGORITHMIC DESIGN BY JOHN MANOOGIAN III (JM3) · DATA BY WIKIPEDIA



FRAMING



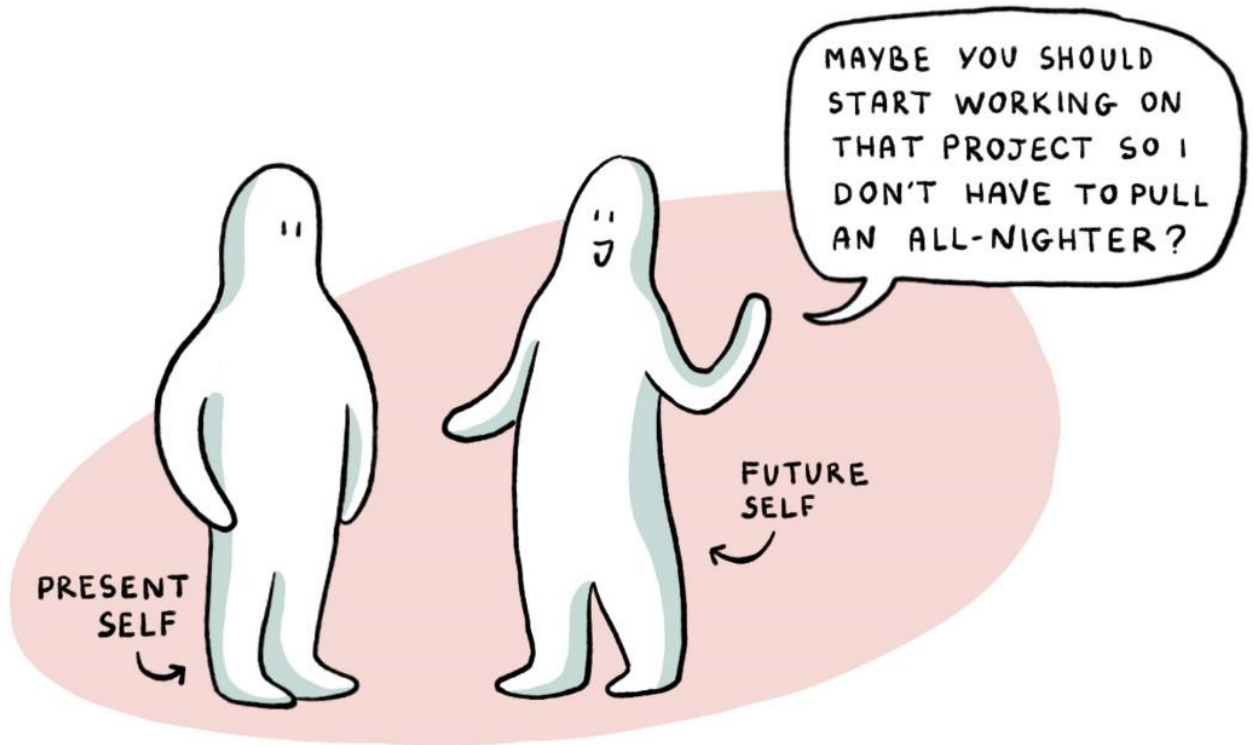
SAVE THE POLAR BEARS!

“Loss-framing is more effective in improving green intentions and behavior”

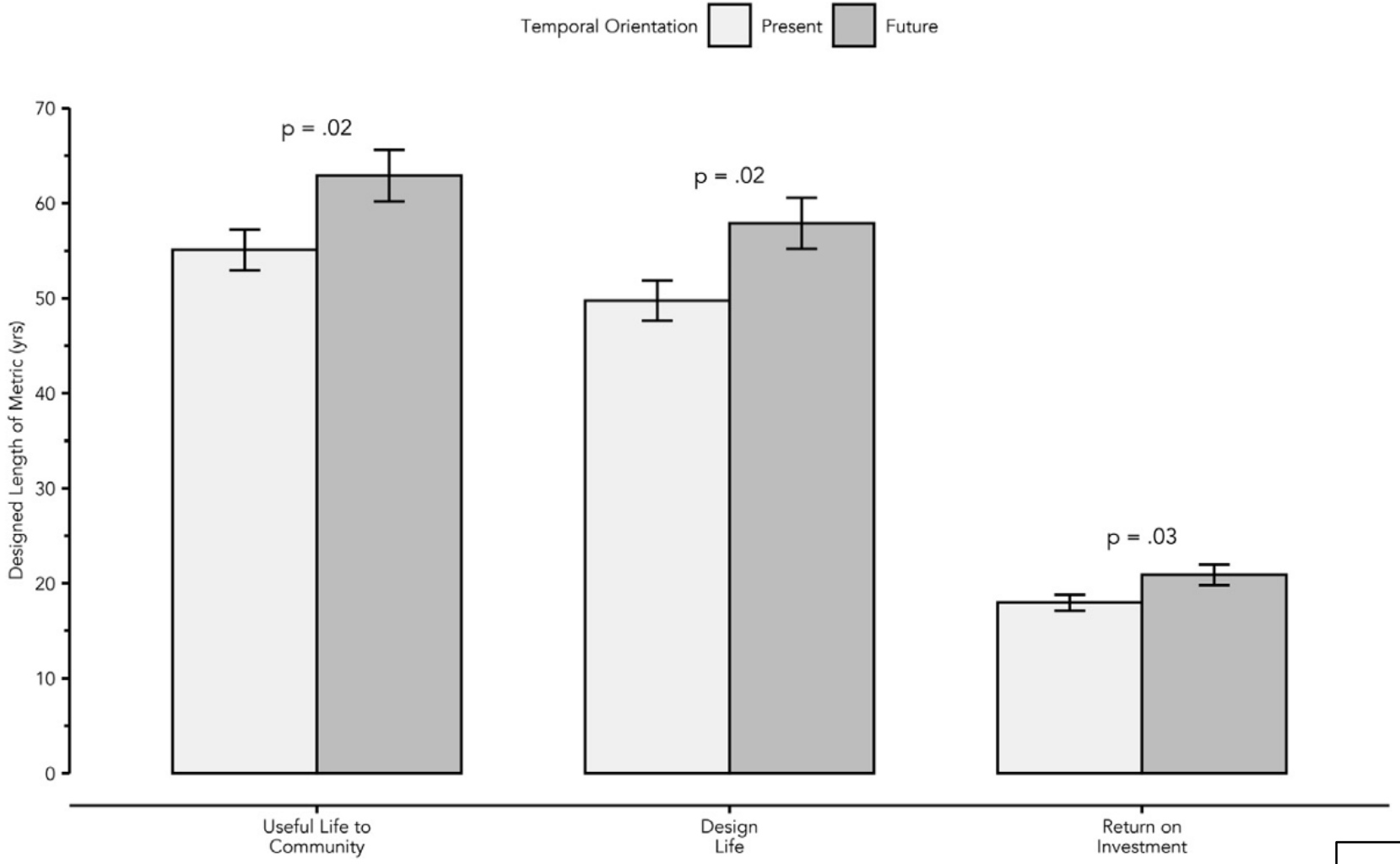
Homar & Cvelbar, 2021

PRESENT BIAS

OUR TENDENCY TO GIVE STRONGER WEIGHT TO PAYOFFS THAT ARE CLOSER TO THE PRESENT.



Future-framing can increase sustainable decision-making.



Hancock et al., 2022

There are other common framing biases.

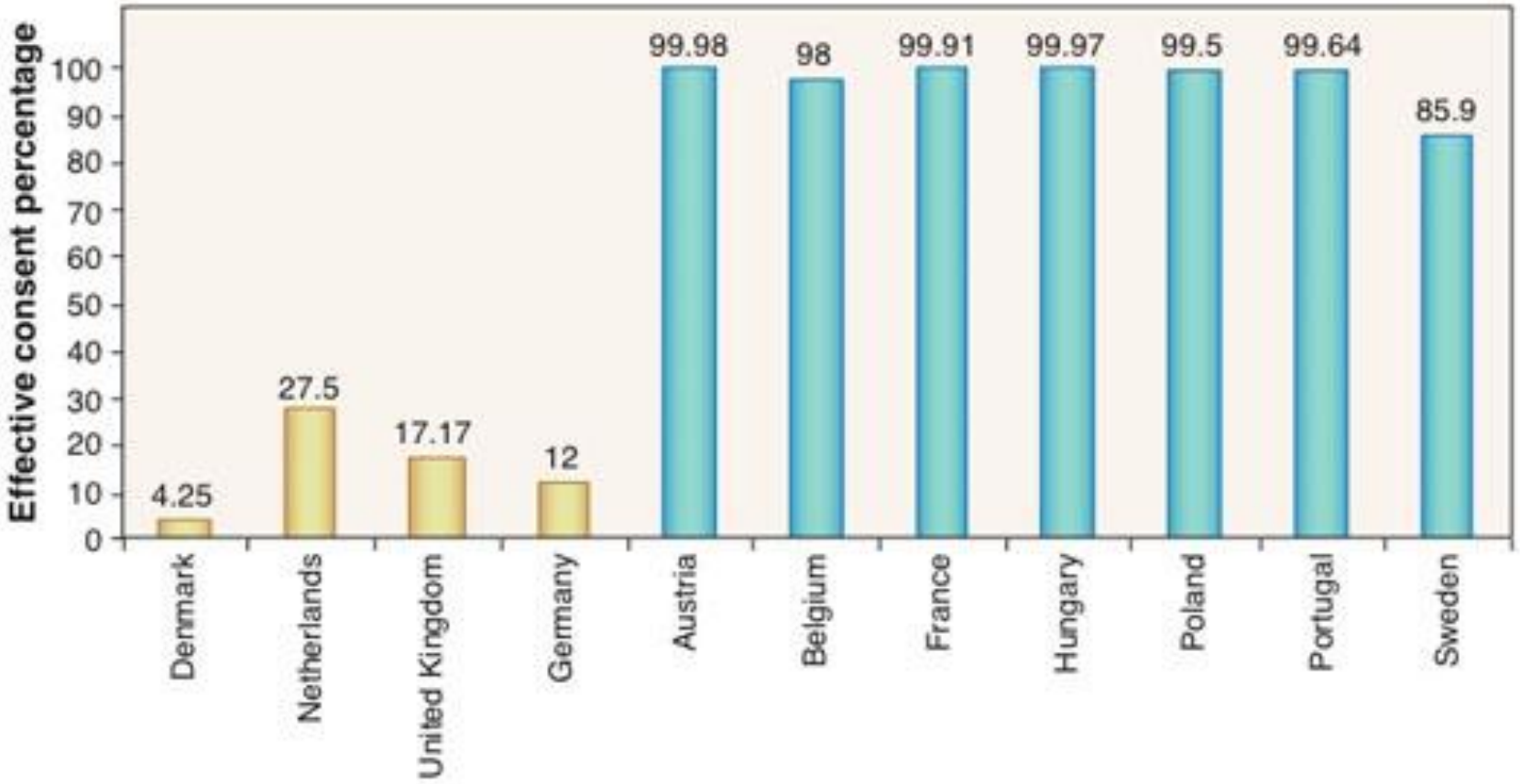
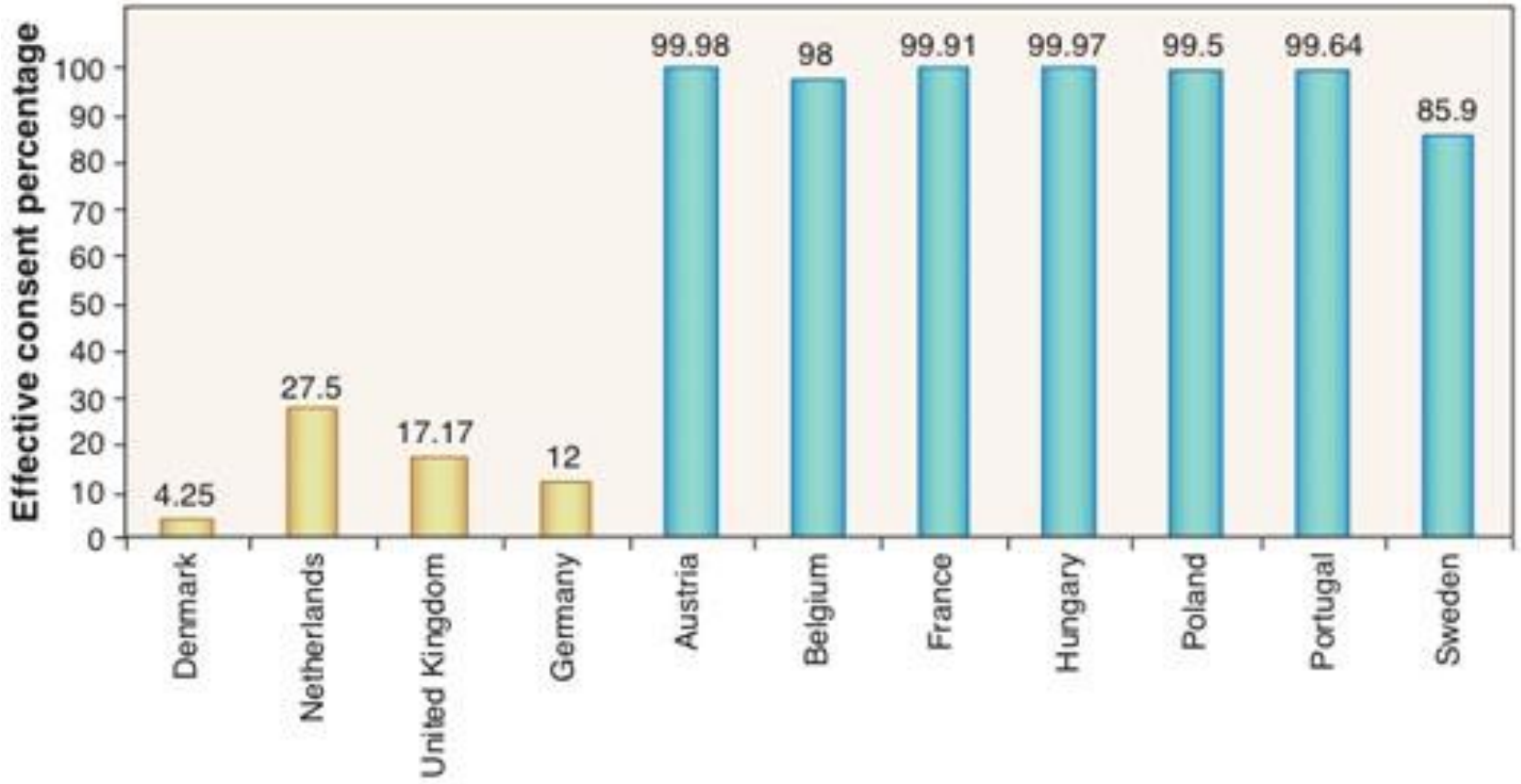


Image from Dan Ariely, danariely.com

There are other common framing biases.



Effective consent rates, by country. Explicit consent (opt-in, gold) and presumed consent (opt-out, blue).

Image from Dan Ariely, danariely.com

To overcome status quo/default bias, require a decision.

Framing effects can inform more sustainable design decisions.

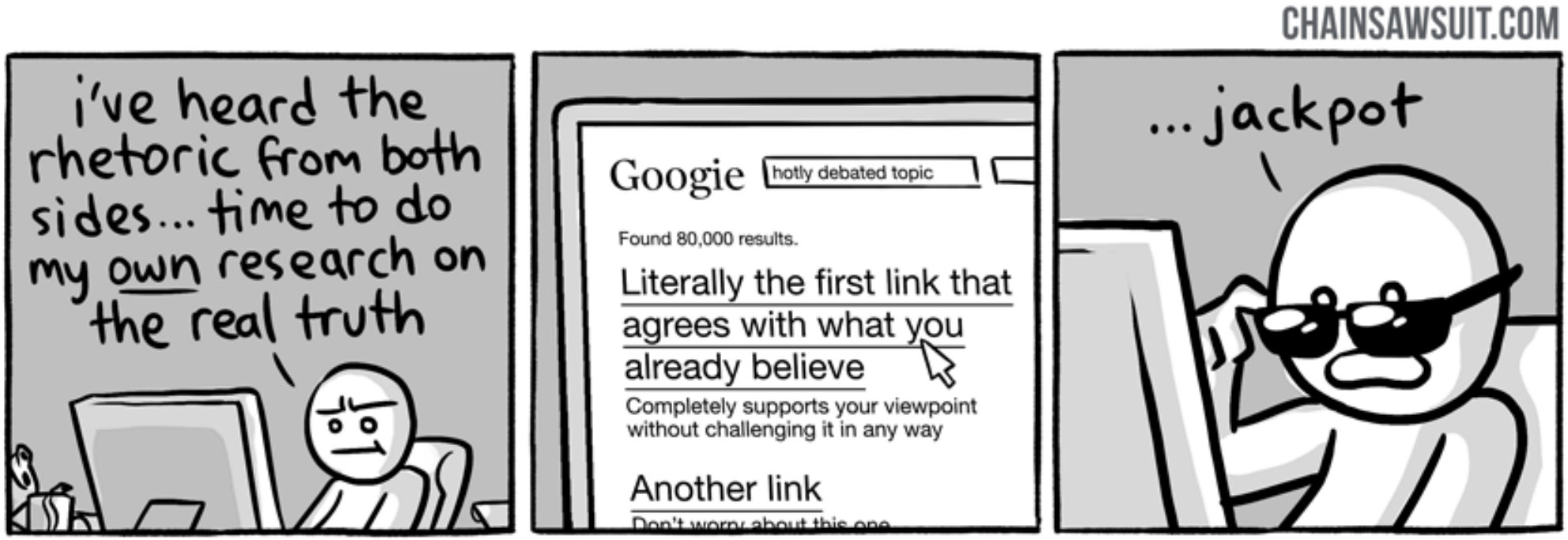
Table 2. Engineers Achieve More Points When Given the Endowed Version of Envision

Statistic	Standard	Endowed
Mean	81	112
SD	40.1	42.6
Percent achieved	51	66
p-value	<0.01	<0.01

Shealy et al., 2016

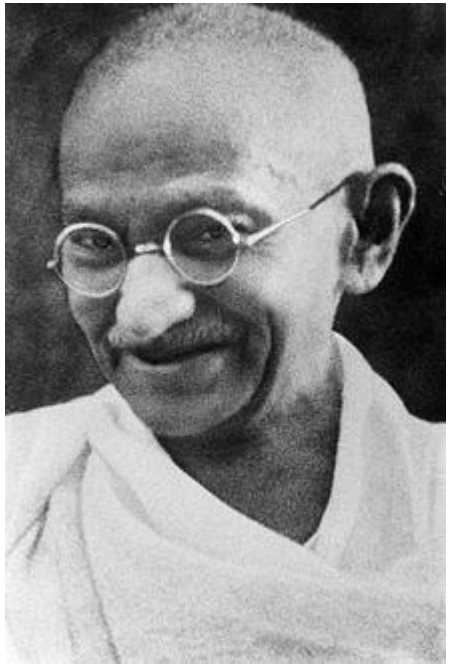
There are [still] other common framing biases.

To overcome confirmation bias, try to prove yourself wrong.



There are [still] other common framing biases.

How old was Mahatma Gandhi when he died?



Adapted from Strack & Mussweiler, 1999.

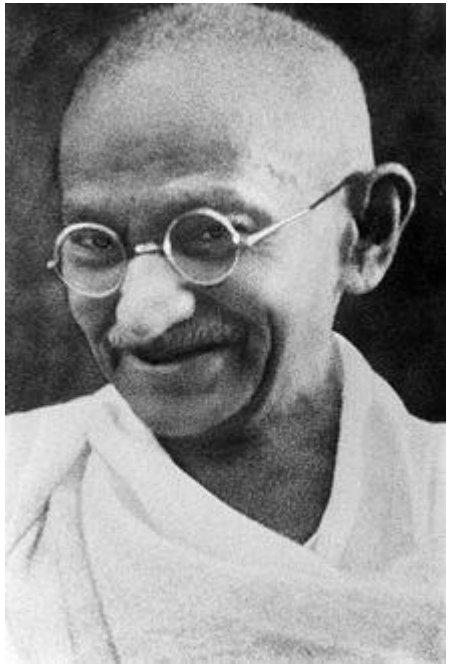
There are [still] other common framing biases.

How old was Mahatma Gandhi when he died?

Did Mahatma Gandhi live beyond **140**?

79

67

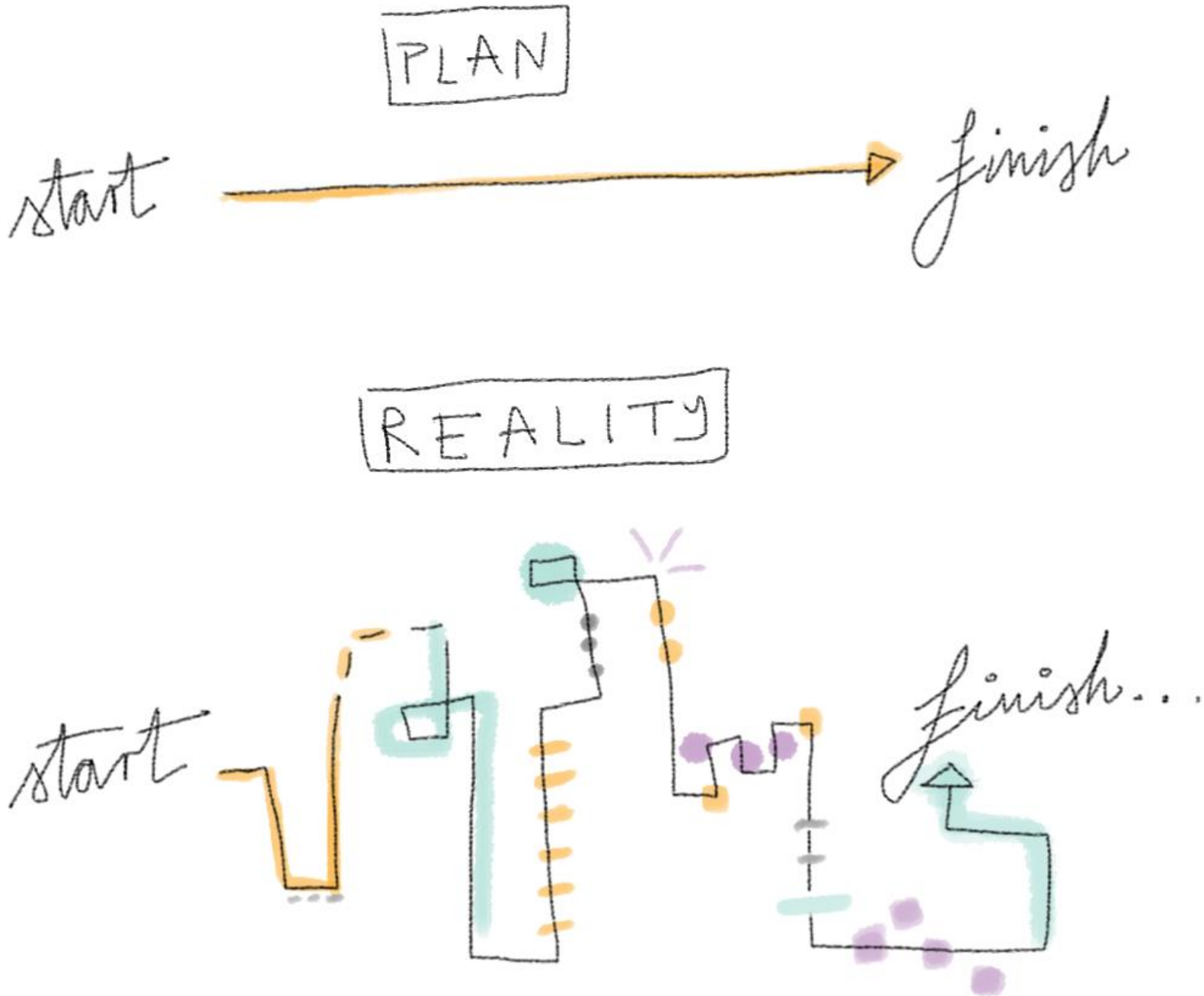


Did Mahatma Gandhi live beyond **9**?

72

50

Adapted from Strack & Mussweiler, 1999.

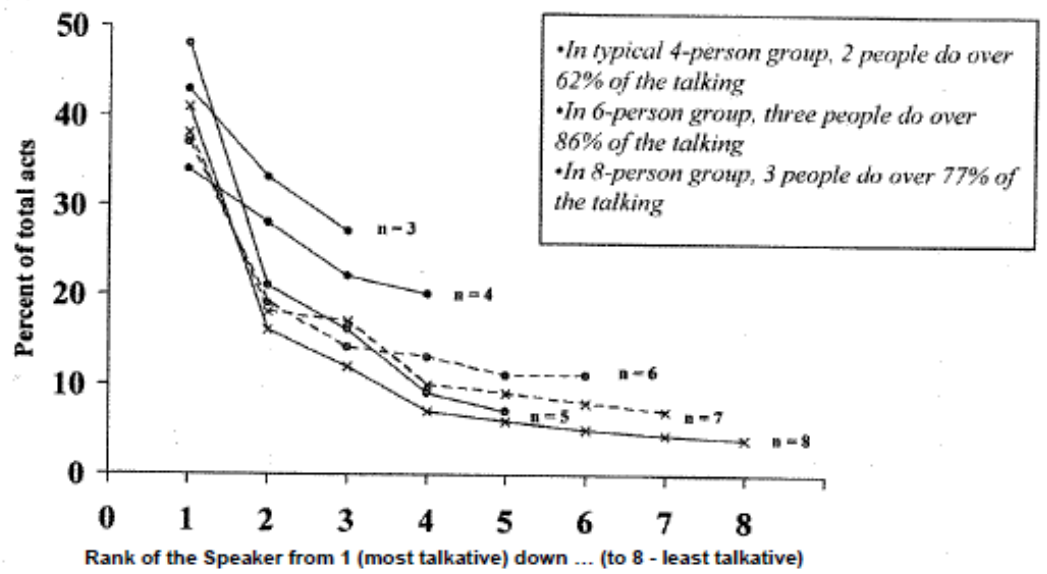

PLAN
start
finish
REALITY
start
finish...

Common failures of teams: uneven participation

People who are higher status/rank speak more

Problem 1: Getting everyone to contribute ...

"Lions and Mice": Total amount of talking as a function of speaker rank - a universal law of social behavior



Common failures of teams: cascading

Common failures of teams: uneven participation

How leaders lead matters!

Create environments that allow for even participation.

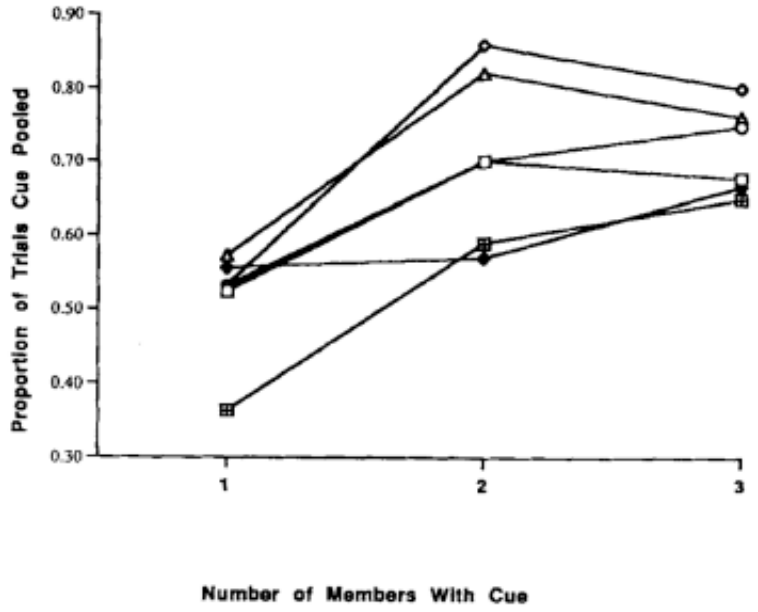
Common failures of teams:

common knowledge effect

Common knowledge is discussed
MORE

The more members who have a piece of information,
the more discussion it receives in the group decision process.
(Gigone & Hastie, 1993, 1996, 1997)

amount
of →
discussion



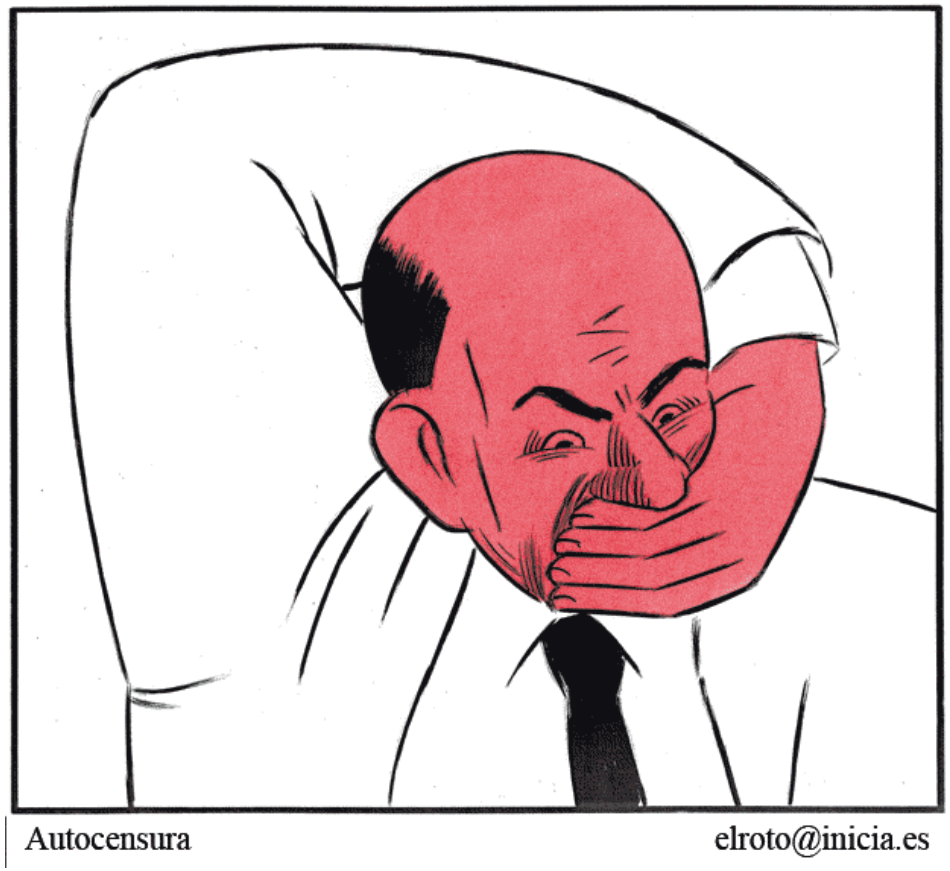
Common failures of teams:

common knowledge effect

How can we expose and share ALL information?

Common failures of teams:

Silencing individuals

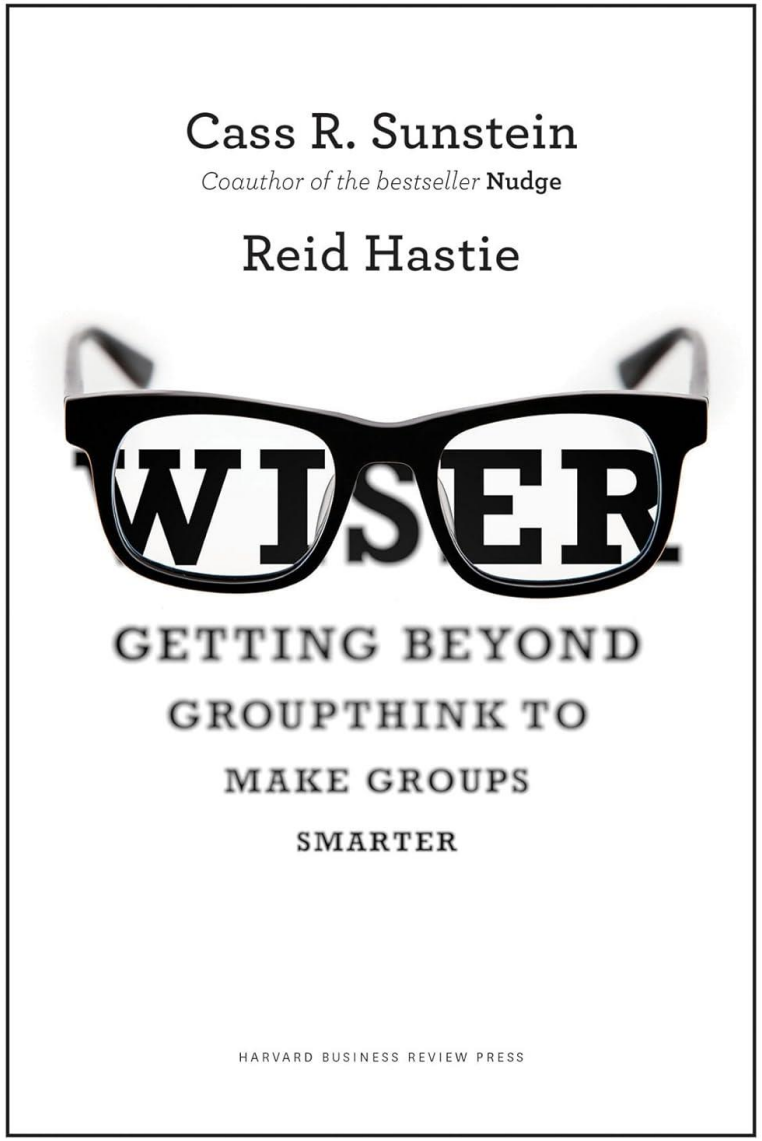


Use “Thank you, because” to help encourage productive disagreement

Zhao et al., 2024, *in prep*

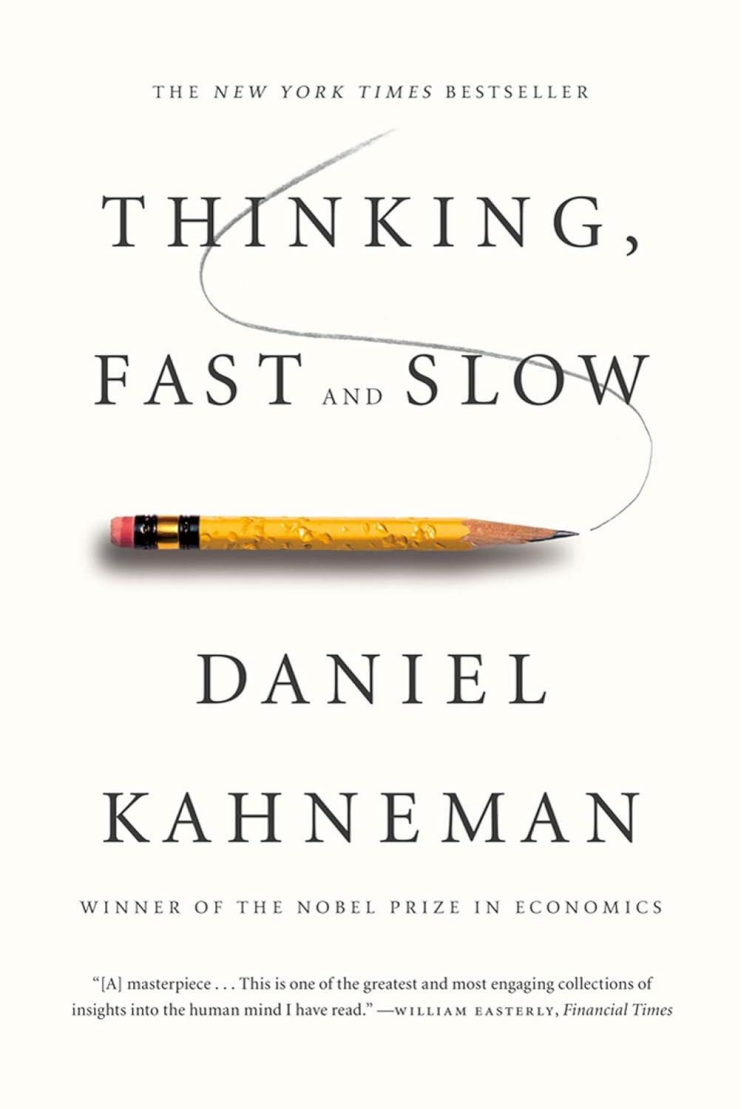
Remedies for common team challenges

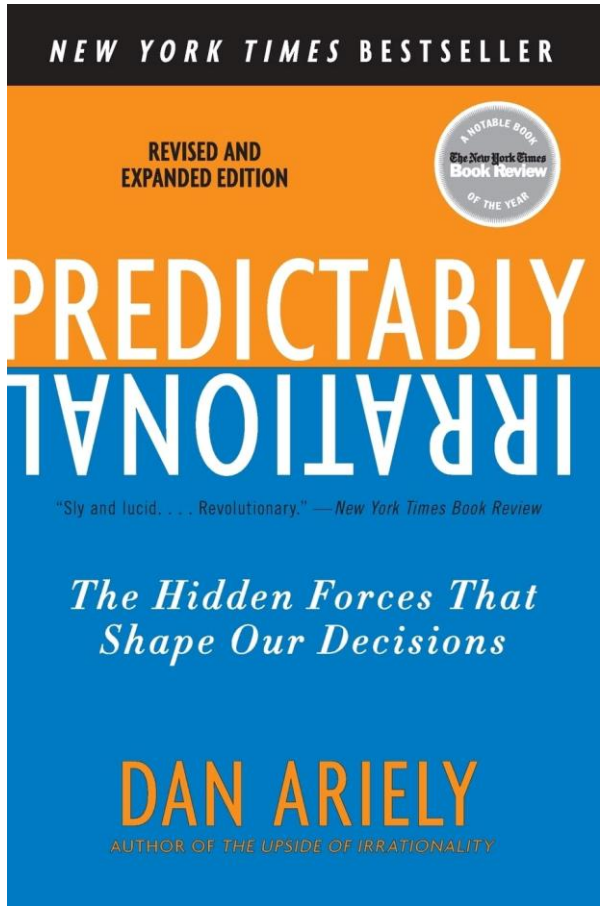
- Inquisitive & self-silencing leaders
- “Priming” critical thinking (vs. consensus)
- Rewarding group success
- Role assignment
- Perspective changing
- Devil’s advocate
- Red teams (contrarian teams)
- Delphi method

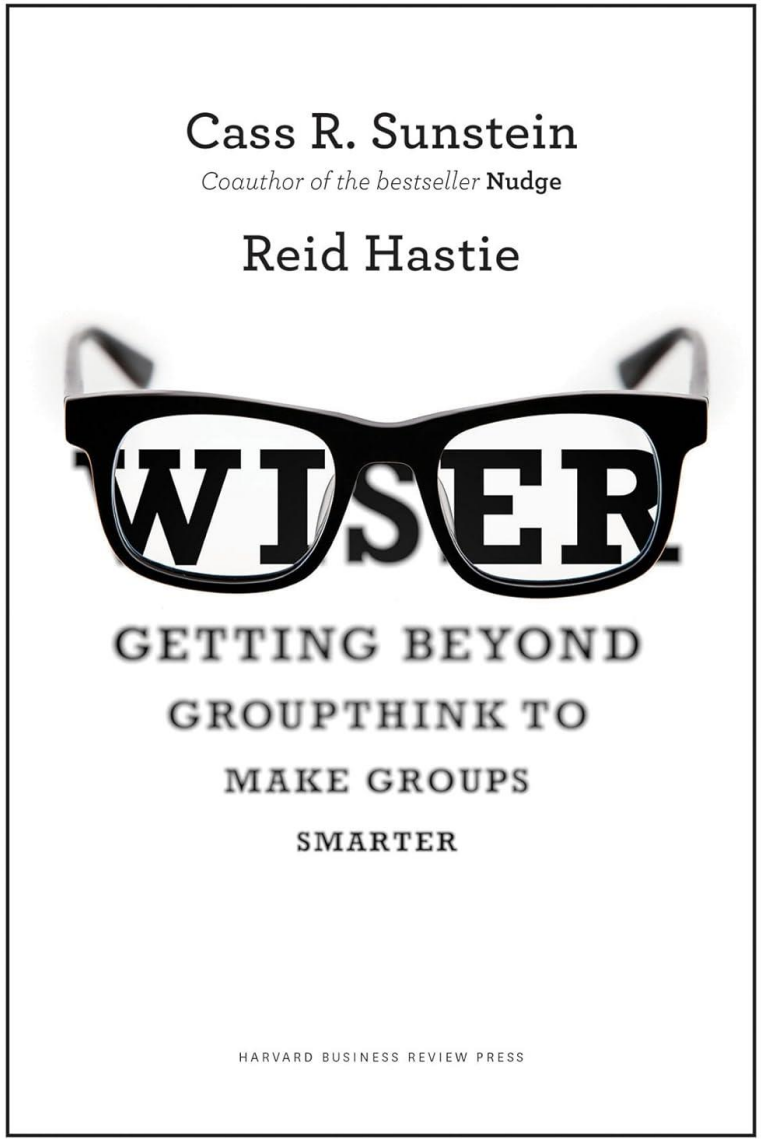


BEHAVIORAL scientist

Other resources



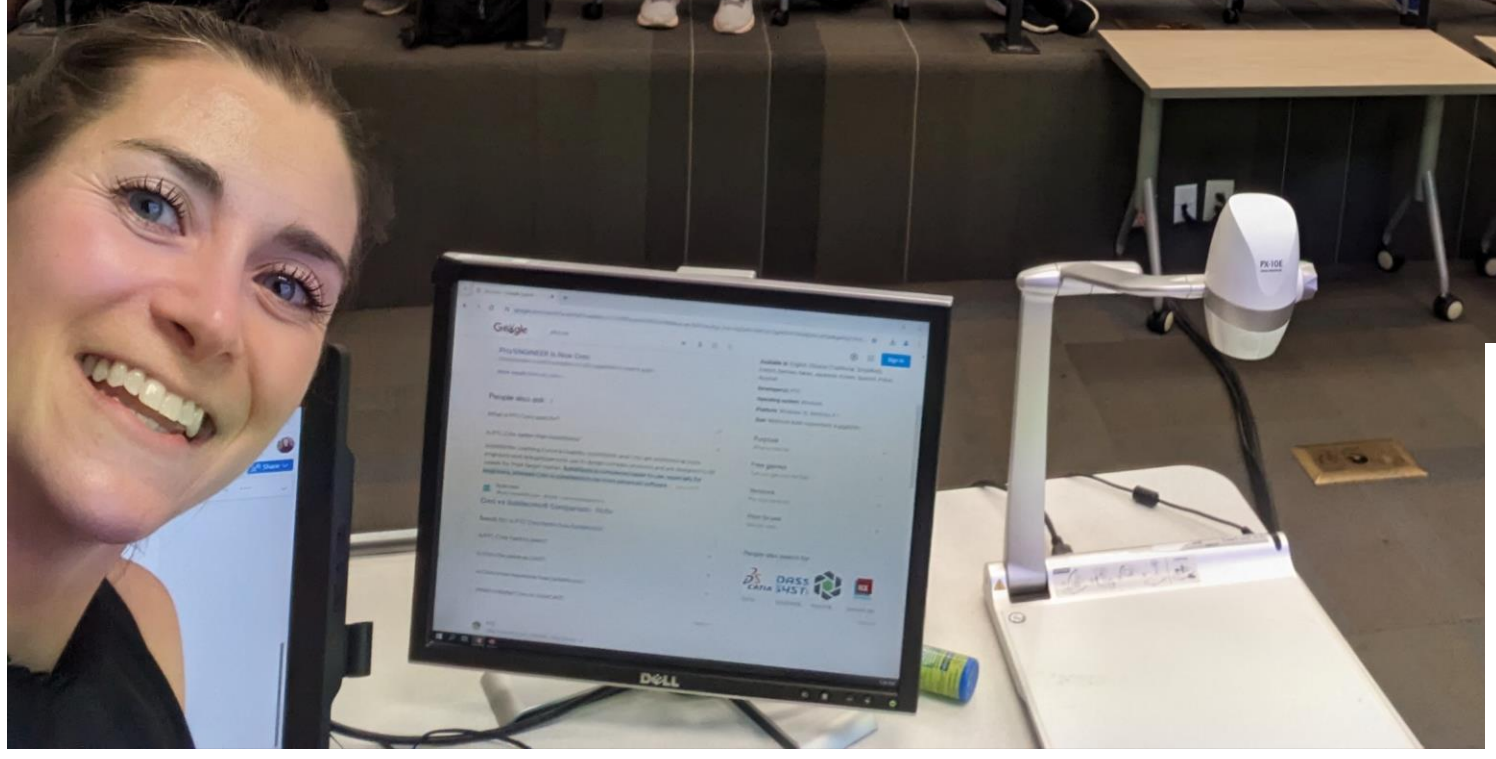




Before we move on to questions,

take some time to reflect:

- What is one thing from this presentation that you'd like to use?
- What is one concrete step you can take to apply it? When/how will you complete it?
- What was the clearest point/topic?
- What was the muddiest point/topic?
- What would you like to learn more about?



I'd love to chat more!

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479.575.3144