





U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND – AVIATION & MISSILE CENTER

Cognitive Bias

Name of Presenter

Rank/Title of Presenter

Organization of Presenter

DISTRIBUTION STATEMENT GOES HERE







Pencils down





PEOPLE



Mike Love Richard Petty Terry Beasley Jake Short Kristin Walker Ron Brown Gordon Ramsey Ozzie Newsome Joshua Reynolds

Carrie Underwood

Brent Johnson Dennis Wilson Thomas Gainsborough Stanley Nowlan Ruben Studdard Dale Earnhardt

Tracy Rocker China Anne McClain

Jamie Oliver

Waloddi Weibull

Lee Roy Jordan

Jordin Sparks Bella Thorne Jeff Gordon William Turner Douglas Felker Pat Sullivan Bobby Flay

Cornelius Bennett

Clair Bailey Brian Wilson

Jimmie Johnson George Stubbs Debby Ryan Cam Newton Larry Kaplow Rachael Ray George Romney Al Jardine Scotty McCreery John Hannah

Bridgit Mendler Bo Jackson **David Pearson Howard Heap Derrick Thomas** Wolfgang Puck Kelly Clarkson James Crowley

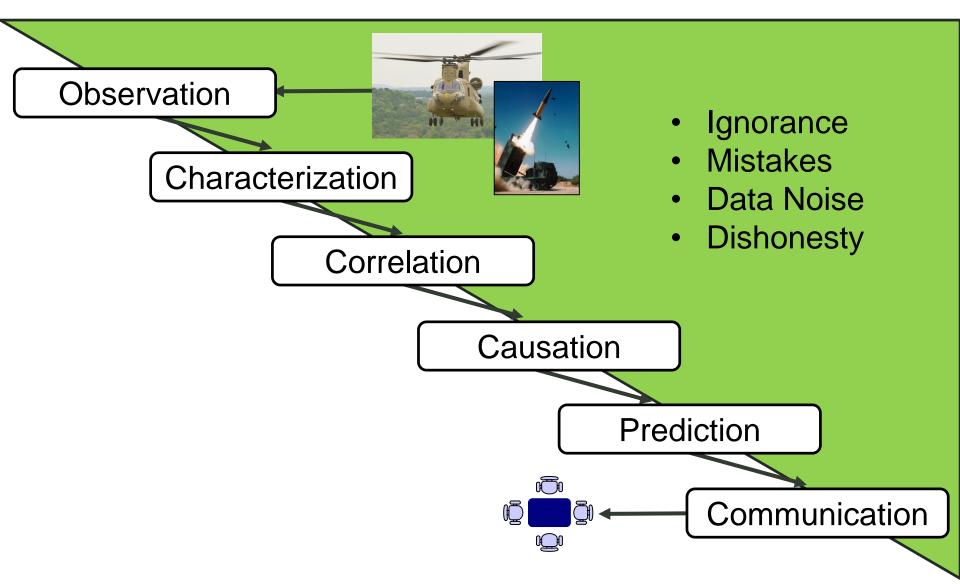
Carl Wilson





RAM WORK



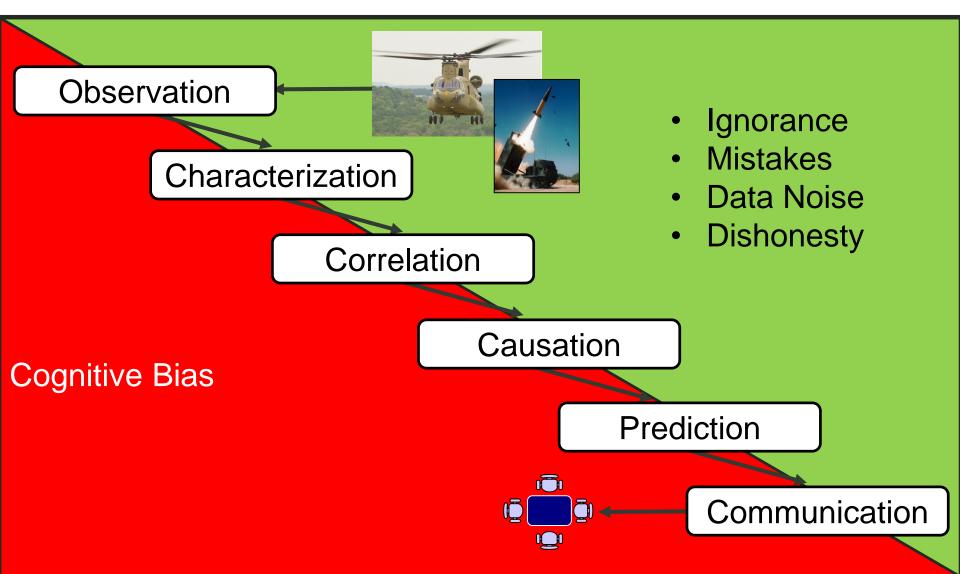






RAM WORK









REFERENCES

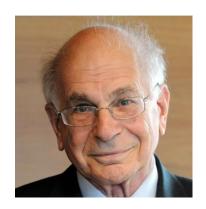




Amos Tversky



Richard Nisbett



Daniel Kahneman



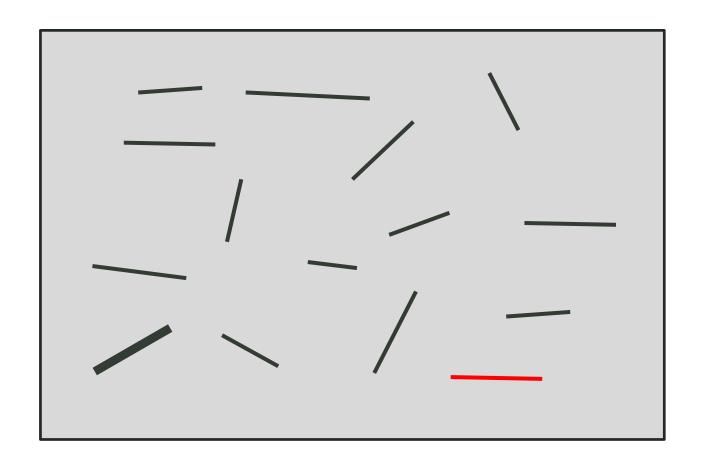
Lee Ross





HEURISTIC – SYSTEM 1 AND 2





DK





DATA SCIENCE HOBBY



Al program Function of a company analytics (what) and buying trends (when).

	Return (12 month)
Dug agr	22.2
Dugtest 2	26.2
Dugtest 1	17.8
Dug variation	14.2
Dugtest (prev year)	12.7
Dow Jones	-5.6%
NASDAQ	-3.9%

What percentage of each output?







HINDSIGHT



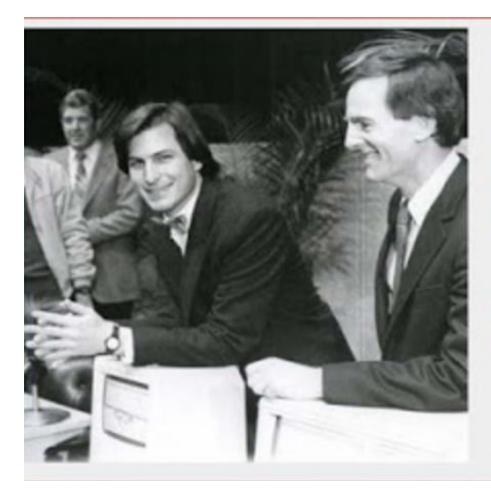
Retu	ırns
26.2%	-1.2%
22.2%	-5.1%
17.8%	-10.7%
14.2%	-13.6%
12.7%	-13.7%
12.4%	-14.4%
6.8%	-14.8%
4.5%	-21.4%
0%	-23.4%
-0.9%	-34.1%











Jobs Pushed Out Of Apple

Apple hired former PepsiCo executive John Sculley in 1983 to serve as the company's CEO. Jobs and Sculley frequently clashed with their competing visions for the company's future and that led to a showdown in 1985 before Apple's board of directors. Jobs lost out in the power struggle and the board stripped him of his management duties.

Later in the year Jobs left Apple entirely and started NeXT Inc. to design a line of workstations for businesses and the education market.

Next Page

Next Page





THE WORST CEOS



John Sculley - Apple

John Sculley notoriously forced Steve Jobs out of Apple, a move that was to be made to look even more foolish in 1997 when Jobs was brought back in. Jobs almost didn't have a company to come back to, though. Sculley's regime was notable primarily for infighting among its leadership and a number of expensive failures such as the Apple Newton. Sculley also made a number of dubious strategic decisions, including raising the price of the Macintosh when personal computer prices were falling, refusing to license the Mac operating system, ignoring the corporate market, and chasing high profit margins at the expense of high market share. He was deposed by the board in 1993 with the company on the brink of bankruptcy.



James Ovenden

Editor

Innovation Enterprise

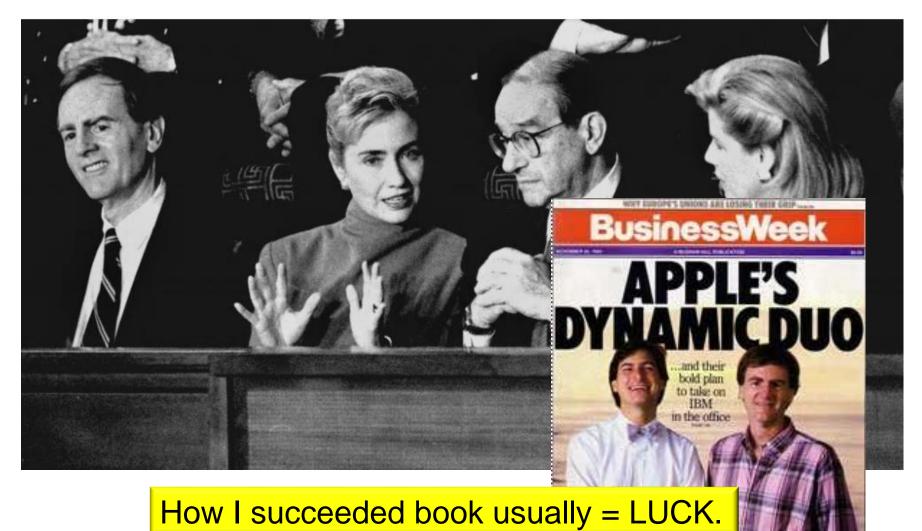






HINDSIGHT BIAS









HINDSIGHT BIAS



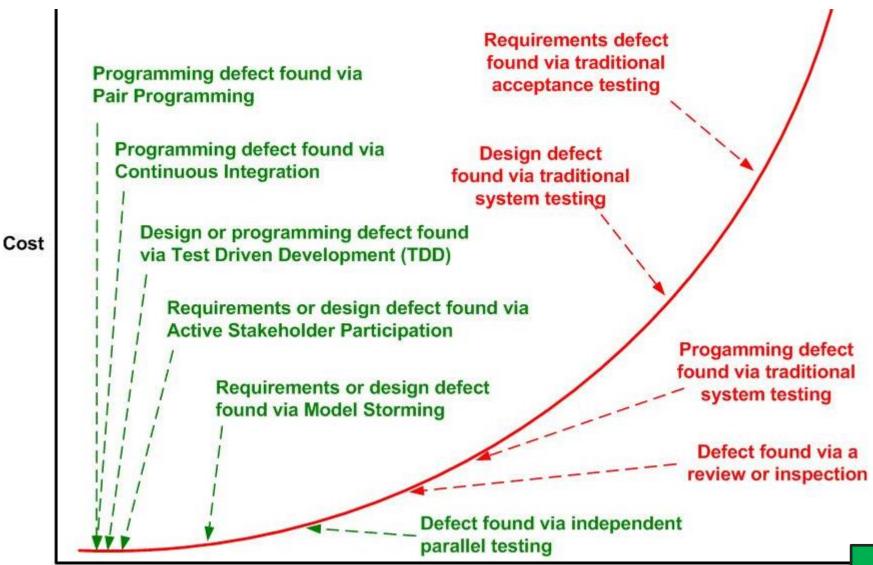
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HINDSIGHT BIAS



Aircraft deliveries

Fiscal				B-52 ı	model				Annual
Year	A [59]	B [2]	C [60]	D [81]	E [62]	F [83]	G [84]	H [4]	Total
1954	3								3
1955		13							13
1956		35	5	1					41
1957		2	30	92					124
1958				77	100	10			187
1959						79	50		129
1960							106		106
1961							37	20	57
1962								68	68
1963								14	14
Total	3	50	35	170	100	89	193	102	742









HINDSIGHT BIAS



Variant	Number built	Notes
NA-73X	1	Prototype
XP-51	2	Prototypes
Mustang Mk I	620	Built for RAF at Inglewood, California
A-36 Apache	500	Dive-bomber variant of P-51; also known as "Invader" or "Mustang"
P-51	150	Built at Inglewood, California. 93 were Lend-Leased to the UK, open USAAF and fitted with Allison V-1710-39 engines.
P-51A-NA	310	Built at Inglewood, California. 50 Lend-Leased to the RAF as the "N
XP-51B	2	Prototypes of P-51B
P-51B-NA	1,987	Built at Inglewood, California. First production version to be equipped with the Merlin engine. 308 supplied under Leng-Lease and operated by the RAF as "Mustang Mk III".
P-51C-NT	1,750	First P-51 variant to be built at North American's Dallas plant. Identica suffixed "-NT". 636 were supplied under Lend-Lease to the RAF as the
XP-51D	3	Prototypes of P-51D
P-51D- NA/-NT	8,200	6,600 built at Inglewood and 1,600 built at Dallas. 100 P-51D-1-NA w in the RAF as the "Mustang Mk IV".
XP-51F	3	Lightweight version
XP-51G	2	Lightweight version; five-bladed propeller
P-51H-NA	555	Built at Inglewood, California
XP-51J	2	Allison-engined lightweight development.





Do it right the first time – nothing but success















https://www.google.com/url?sa= t&rct=j&q=&esrc=s&source=vid eo&cd=1&cad=rja&uact=8&ved =0ahUKEwiPmJuDrLIAhXupVkKHbKEApYQtwIIKD AA&url=https%3A%2F%2Fwww .youtube.com%2Fwatch%3Fv% 3Drf71YotfykQ&usg=AOvVaw0v 87MJ6oHWYv18jn9qU7LO







Circa 1475





Believed the Sun went around the Earth

Could not read or write

Spent their life within 2 miles of where they were born

Slept with livestock and had worms

Believed diseases came from bad smells

Believed in Witches





Circa 1475











FUNDAMENTAL ATTRIBUTION ERROR



The tendency to attribute behavior exclusively to the actor's <u>dispositions</u> and to ignore powerful <u>situational</u> determinants of the behavior.

- Lazy, Bureaucratic, Format over Substance.
- Greedy, Arrogant, Not to be trusted.
- Teacher's Pet, Hard Working, Yes Man.
- Lazy, Bureaucratic, Format over Substance.







FUNDAMENTAL ATTRIBUTION ERROR



MICOM

Lazy, Bureaucratic, Format over Substance.

BOEING

Greedy, Arrogant, Not to be Trusted.

MTA

Teacher's Pet, Hard Working, Yes Man.

AVMC

Lazy, Bureaucratic, Format over Substance.

Referees ARE Fair







FUNDAMENTAL ATTRIBUTION ERROR













You believe you have Felker's disease. This disease is contracted by 200 thousand Americans each year. A doctor gives you a test that has a false positive rate (stating you have the disease when you don't) of only 0.005.

You test positive (the test says you have the disease).

How likely are you to have the disease?









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You test positive (the test says you have the disease).

How likely are you to have the disease?

<11.8 %









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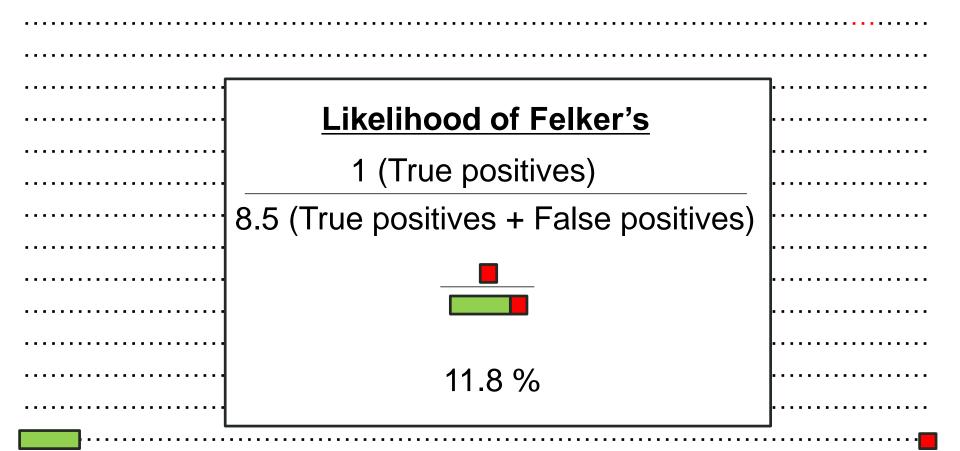






FALSE POSITIVE PARADOX









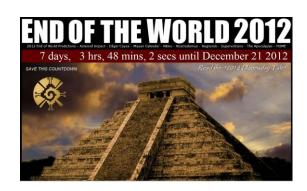
IGNORING THE BASE RATE



Regression to the Mean

- Shooter is Hot
- Sophomore Slump
- Yelling at pilots works

Sometimes the Base Rate is Random



Sometimes the Base Rate is Random (noisy)

If you hear hoofs, thinks horses not zebras.







RELIABILITY IMPROVEMENTS FOR FAKE ENGINE



			-	-				Intern	al Fa	ilure	(61%))				-		-						-					-				
		es (tu ompre			isks a earing	-	Sta	or rela	ated	Eng	ine Ca	asing	Igniti	on sy	stem	:	Shafts	3		Leaks	5	ı	-atigu	е	Exte	rnal F	ailure	M	lountii	ng	E	lectric	al
2410 / ASAP %		25%			25%			5%			2%			2%			2%			13%			12%			7%			5%			2%	
Constraint	DT	х	FVL	DT	х	FVL	DT	х	FVL	DT	х	FVL	DT	х	FVL	DT	х	FVL	DT	х	FVL	DT	х	FVL	DT	х	FVL	DT	х	FVL	DT	х	FVL
Advanced Lubricants				5%	5%	5%										5%	5%	5%															
Additive Manufacturing	5%	10%	12%				8%	10%	12%	10%	12%	14%	5%	5%	5%				6%	8%	10%	5%	5%	7%									
Advanced Coatings	5%	10%	12%	5%	10%	10%	5%	10%	10%	5%	10%	10%				5%	5%	5%							5%	5%	5%						
Advanced Combustion Eff.													10%	10%	30%																		
Advanced Material	5%	6%	7%	3%	3%	5%	3%	3%	5%	2%	3%	3%	2%	2%	3%	3%	3%	5%				5%	5%	8%	2%	2%	3%						
Advanced Seals																			5%	5%	5%												
Health Monitoring (Regime Recognition)																						5%	5%	20%									
Health Monitoring (Predictive)	1%	1%	3%	5%	5%	10%	1%	1%	3%	1%	1%	3%	0%	0%	5%	5%	10%	20%	0%	2%	5%	1%	2%	3%	2%	2%	5%	2%	2%	5%			
Improved Sand Separation	0%	2%	10%				0%	2%	10%																								
Advanced Design Concepts	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	5%	5%	8%	5%	5%	8%	5%	5%	8%	2%	3%	4%	10%	20%	30%
Advanced Cooling	2%	3%	5%	2%	3%	5%	2%	3%	5%	2%	3%	5%	2%	3%	5%	0%	0%	2%				0%	0%	2%									











SB sk









SB sk





SAMPLE BIAS



Questioner and Contestant Game

Post Game General Knowledge Estimate (0-100)

Questioner's Score

Contestant's Score

$$Q - 68$$
 $C - 41$

Observer's Score

$$Q - 82$$
 $C - 49$

$$C - 49$$

Ross, Amablie, and Steinmetz 1977





CAR INSURANCE COMMERCIAL



Drivers who switched, Saved an average \$350!

For customers with accident forgiveness, There Rates won't go Up!

For customers with new car replacement, They won't drive around on three wheels!

Skewed samples hide in the assumptions and fine print.

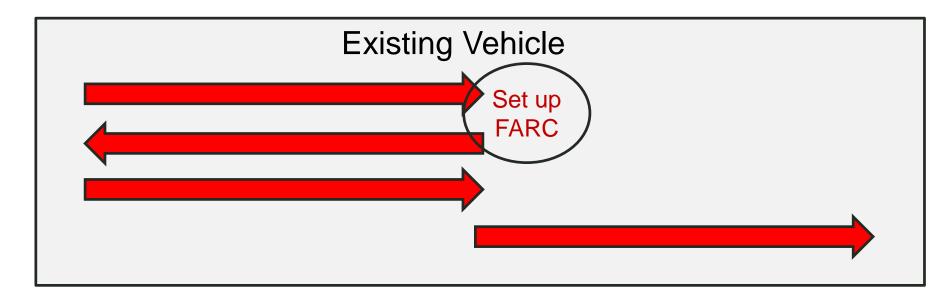








Mission = 200 miles away



Improved Vehicle

75% Reduction in Sorties!







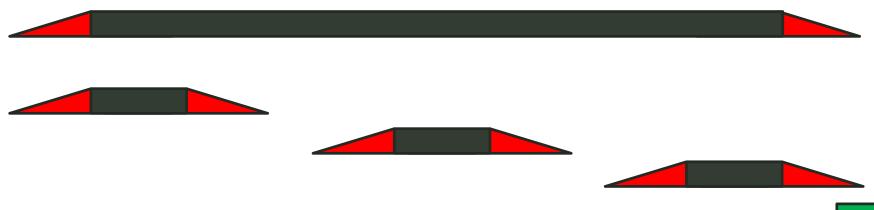
RANDOMNESS = MORE WORK NOT LESS



- DO NOT FORCE THE INPUT TO RANDOM
 - Take all data and Understand the sample then compensate.

$$Z_0 = \frac{\overline{x_1} - \overline{x_2} - \Delta_0}{\sqrt{\frac{\sigma_n^2}{n} + \frac{\sigma_N^2}{N}}}$$

ASAP Scoring

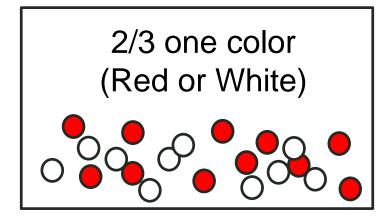




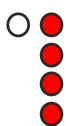


RED OR WHITE

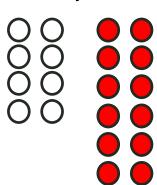




Sample 1



Sample 2











There are two hospital in one town. In the large hospital 45 babies are born a day. In the smaller one 15 babies are born a day. Which hospital has more days of at least 60% boys born?

- The larger hospital
- The smaller hospital
- About the same (within 5 %)

In a five-game series, the worst team in baseball will beat the best about what percentage of the time?

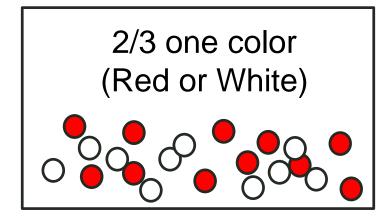




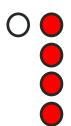


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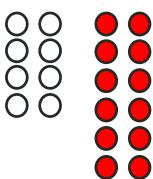




Sample 1



Sample 2



8 to 1 odds = White 2/3

16 to 1 odds = White 2/3







LAW OF SMALL NUMBERS



There are two hospital in one town. In the large hospital 45 babies are born a day. In the smaller one 15 babies are born a day. Which hospital has more days of 60% boys born?

- The larger hospital (21)
- The smaller hospital (21)
- About the same (within 5 %) (53)

In a five-game series, the worst team in baseball will beat the best about what percentage of the time?

15%

(Moneyball - Michael Lewis)









Eliminates doubt by suppressing ambiguity and automatically constructs coherent stories that help explain our observations.

It embellishes scraps of information to produce a much richer image than the facts often justify.

Is prone to jumping to conclusions and will construct a vision of reality that is too coherent and believable.

SB s#







Humans are pattern seekers and look for meaning in their observations.

People do not expect to observe regular patterns from a random process and when they do see a potential correlation they are far too quick to reject the assumption that the process is entirely random.

> Neal Cole Greenbook blog May11 2012

Test/Demonstration Plans are for budget & schedule.
Information comes from Data.







LAW OF SMALL NUMBERS



 Modern Army Systems cannot demonstrate full release for reliability (80% confidence) from a test program before FUE.





When did failing a demonstration test become a bad thing?









Bathroom break

(for half of you)







- Is the height of the tallest redwood more or less than 1200 feet?
 - What is you best guess about the height of the tallest redwood?
- Was the batting average of the 1930 cardinals more or less than .320?
 - What is you best guess about of the 1930 cardinals batting average?
- Does the space station travel faster than 50000 mph?
 - How fast does the space station travel?









- Is the height of the tallest redwood more or less than 120 feet?
 - What is you best guess about the height of the tallest redwood?
- Was the batting average of the 1930 cardinals more or less than .285
 - What is you best guess about of the 1930 cardinals batting average?
- Does the space station travel faster than 5000 mph?
 - How fast does the space station travel?









Premature Commitment and Insufficient Revision

- Observers watched a subject solve 15 out of 30 logic problems
 - Subject that solved the 15 early were judged smarter (Jones, Rock, Shaver, Goethals, and Ward 1968)
- What would it take to put you in this new car?
- Coffee cup experiment
- How many of you still think I can pick Stocks?
- FYI
 - Tallest living redwood ~380 ft.
 - 1930 Cardinals batted .314.
 - Space station travels at 17,500 miles per hour.

ach





Anchoring







ach





TOM W. PROBLEM



Tom W. is of high intelligence, although lacking true creativity. He has a need for order and clarity, and for neat and tidy systems in which every detail finds the appropriate place. His writing is rather dull and mechanical, occasionally enlivened by somewhat corny puns and flashes of imagination of the sci-fi type. He has a strong drive for competence. He seems to have little feel and little sympathy for other people, and does not enjoy interacting with others. Self-centered, he nonetheless has a deep moral sense.





TOM W. PROBLEM



- A. Business Administration
- B. Computer Science
- C. Engineering
- D. Education
- E. Law
- F. Biology
- G. Library Science
- H. Psychology
- Social Sciences and History







TOM W. PROBLEM



Α.	Business Administration	381,353
B.	Computer Science	71,420
C.	Engineering	115,640
D.	Education	85,118
E.	Law	4,272
F.	Biology	116,759
G.	Library Science	109
Н.	Psychology	117,447
I .	Social Sciences and History	161,211





JACK AND DICK



- Jack is a 45-year old man. He is married and his four children. He is generally a conservative, careful, and ambitious. He has no interest in political and social issues and spends most of his free time on his many hobbies which include carpentry, sailing, and mathematical puzzles.
- Dick is a 30-year old man. He is married with no children. A man of high ability and high motivation, he promises to be quite successful in his field. He is well liked be his colleagues.

Given 5 personality sketches (From Very Lawyer-like to Very Engineer-like)

Asked to rate the likelihood of an Engineer.

T&K







LAWYER ENGINEER 70/30



Told from sample	Told from sample
of 70% Engineers	of 70% Lawyers

Sketch 1	5%	5%
Sketch 2	40%	30%
Sketch 3	50%	50%
Sketch 4	92%	89%
Sketch 5	94%	98%

One constantly goes beyond the information given. Jerome Bruner

K&T



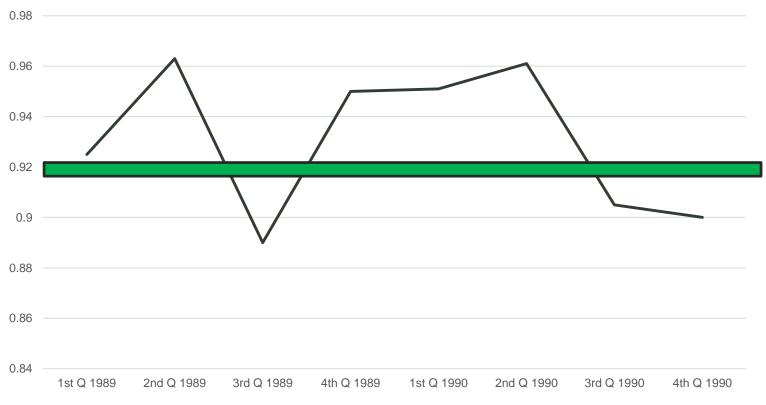




REPRESENTATIVE BIAS









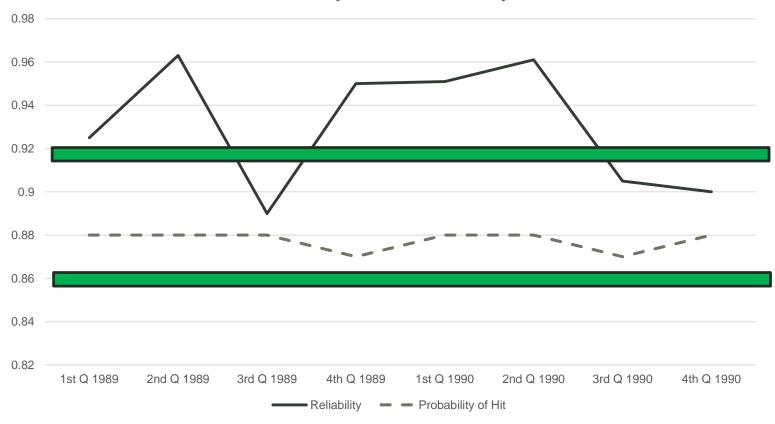




REPRESENTATIVE BIAS



Fake Reliability and Probability of Hit



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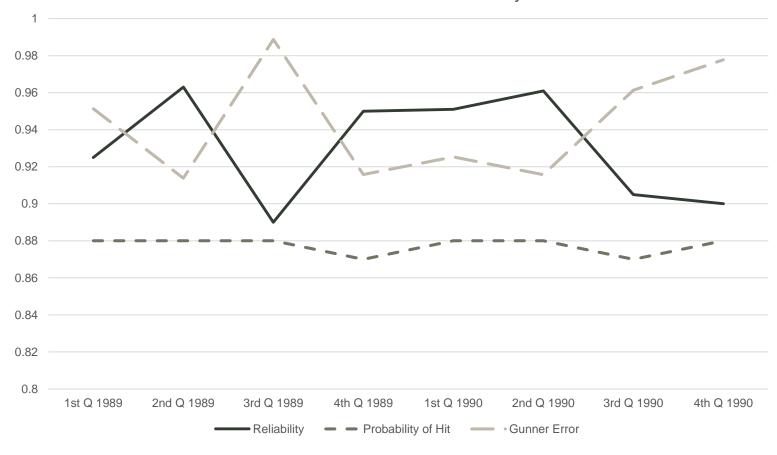




REPRESENTATIVE BIAS



Fake Gunner Error & Reliability









Linda is thirty-one years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti nuclear demonstrations.







LINDA PROBLEM



- A. Linda is a teacher in an elementary School
- B. Linda works in a bookstore and takes yoga classes
- C. Linda is active in the feminist movement
- D. Linda is a psychiatric worker
- E. Linda is a member of the League of Woman Voters
- F. Linda is a bank teller
- G. Linda is an insurance salesperson
- H. Linda is bank teller and is active in the feminist movement





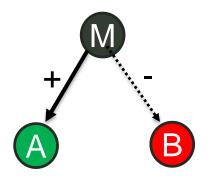


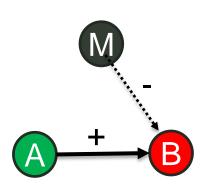
CASUAL CONJUNCTION



Linda is a bank teller

Linda is bank teller and is active in the feminist movement









CASUAL CONJUNCTION



Capital Punishment

- Panel Design Evidence (State before and After)
- 2. Concurrent Design (Two States at Same Time)

Best evidence design = View on Capital Punishment

Children with new magic makers

The extrinsic "good player award" replaced intrinsic fun.

Rewarded Children played less with Markers





CASUAL CONJUNCTION



Causation Prejudice – (Mill 1974)

- To seek a single sufficient explanation for any event
- Consensus
- Narrative
- First Emotional Commitment

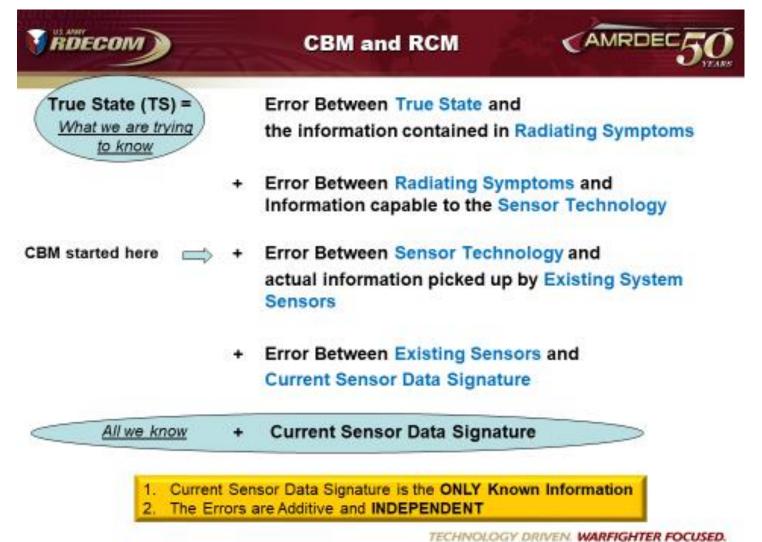
The most deeply rooted fallacy....is that the conditions of a phenomenon must or at least probably will, resemble the phenomenon itself.

John Stuart Mill







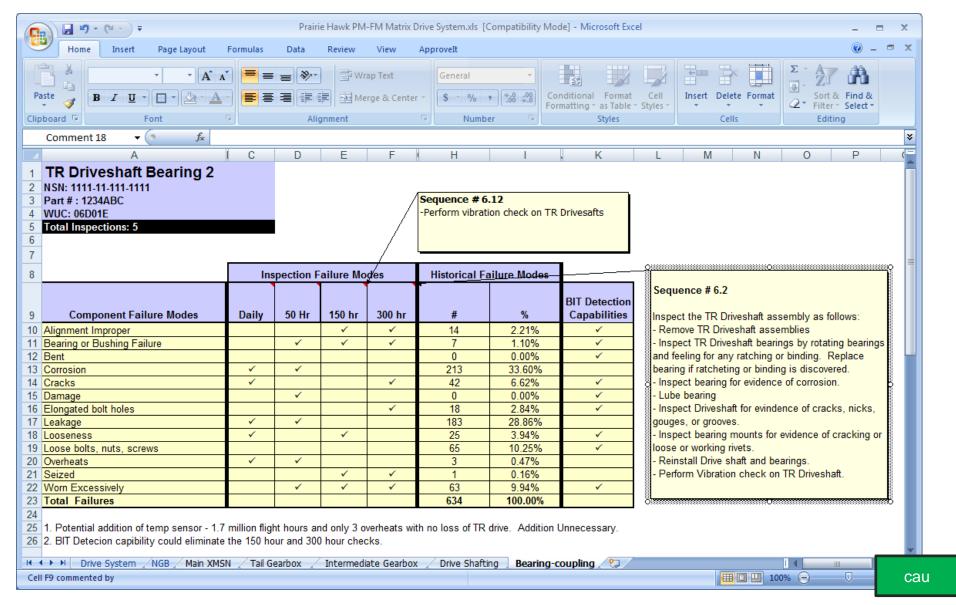






PM/FM MATRIX (CAUSAL)











Come up with as many words as can that fit the following pattern:

_ _ _ _ n _







Come up with as many words as can that fit the following pattern:

___ ing

K&T









WRITE DOWN THE PEOPLE.





PEOPLE



1
Dennis Wilson
Carl Wilson
Brian Wilson
Mike Love
Al Jardine

2 George Romney Joshua Reynolds William Turner Thomas Gainsborough

3
Douglas Felker
Kristin Walker
Stanley Nowlan
Howard Heap
Waloddi Weibull

George Stubbs

4
Carrie Underwood
Kelly Clarkson
Jordin Sparks
Ruben Studdard
Scotty McCreery

5
Brent Johnson
Clair Bailey
Ron Brown
Larry Kaplow
James Crowley

6
David Pearson
Jeff Gordon
Jimmie Johnson
Dale Earnhardt
Richard Petty

7
Bo Jackson
Pat Sullivan
Cam Newton
Tracy Rocker
Terry Beasley

8
John Hannah
Cornelius Bennett
Lee Roy Jordan
Ozzie Newsome
Derrick Thomas

9
Bridgit Mendler
Debby Ryan
Bella Thorne
China Anne McClain
Jake Short

10
Jamie Oliver
Gordon Ramsey
Rachael Ray
Bobby Flay
Wolfgang Puck

ava





Availability



Ease of Generation = Likelihood

- Rehearsal
- Vivid data vs. Pallid data
- Emotional data

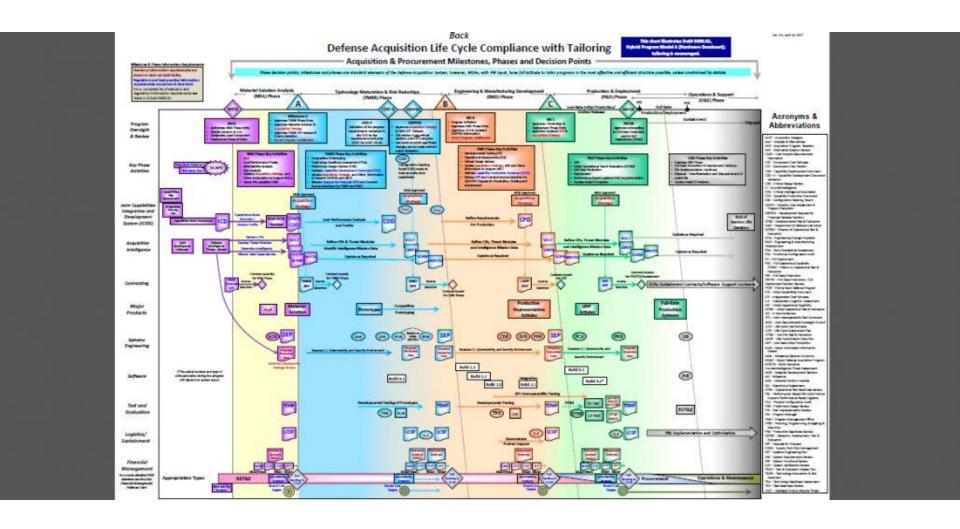
ava





Availability













Closing





WITHOUT HEURISTICS



Brain scans of individuals high on the drug revealed that the chemical allows parts of the cortex to become flooded with signals that are normally filtered out to prevent information overload.

The drug allowed more information to flow from the thalamus, a kind of <u>neural gatekeeper</u>, to a region called the posterior cingulate cortex, and it stemmed the flow of information to another part known as the temporal cortex.

The Guardian
Study shows how LSD interferes with brain's signalling

lan Sample Science editor

Mon 28 Jan 2019 15.00 EST





YOU ARE DOING IT



It is quite wrong to try founding a theory on observable magnitudes alone. In reality the opposite happens. It is the theory which decides what we can observe.

Albert Einstein

Data does not speak for itself





HAVE TO DO IT











FUNDAMENTAL ATTRIBUTION ERROR



KO's need a paper trial – many of their actions are legal not logical

Airworthiness means someone has sign his name

Many actions rise from potential audits

Contractors and government workers all went to the same school.





WHAT DO THE OTHER CELLS LOOK LIKE?



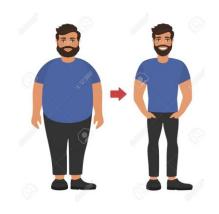
Build a 2X2 Cell

Unsuccessful Successful

Attempted a Diet Plan

Attempted XYZ
Diet Plan

200	50
40	4



R&N





HAVE A GENERAL VIGILANCE



Bias in Expected or Neutral Outcomes.

Skews from Disinterested People.

Actor and observers accounts based upon theory.

Explaining away exceptions.

Processed information or Raw data.

You are taking more credit than you deserve.















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