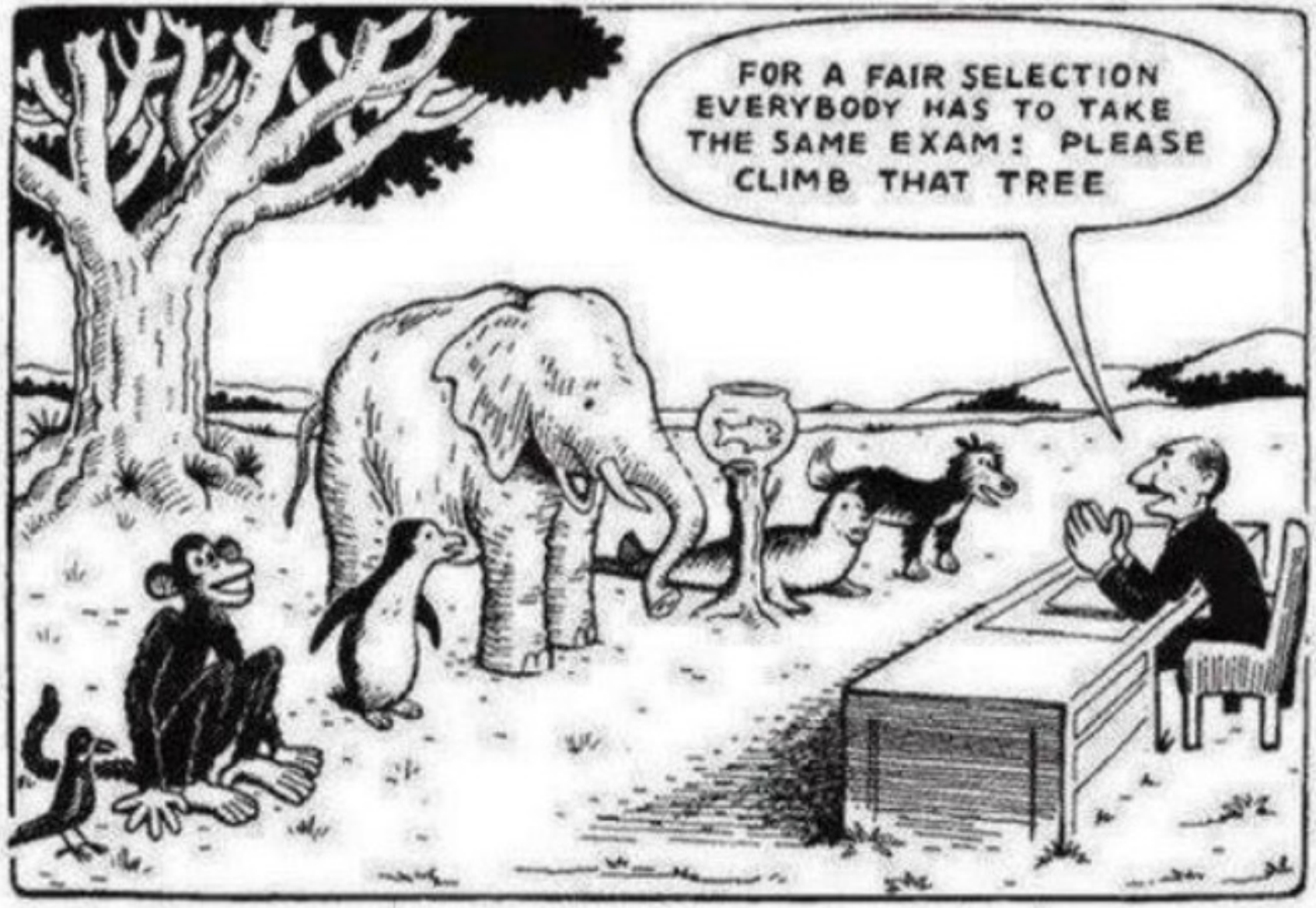
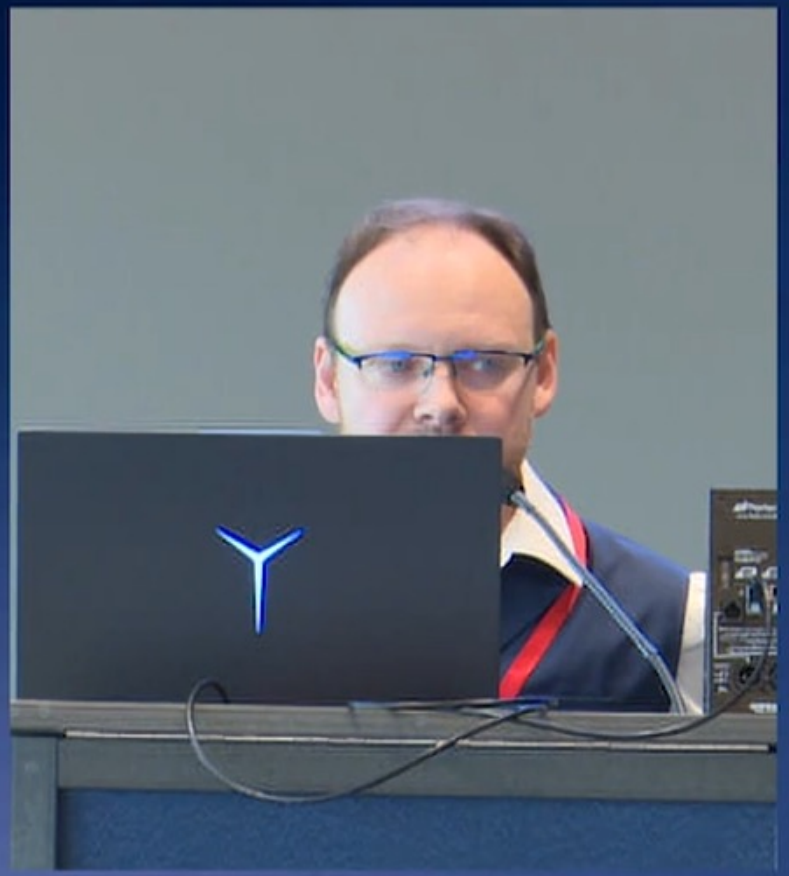
One Size Does Not Fit All!

The Diversity & Evolution of QRA Throughout a Project Lifecycle



Safran Risk

Project Controls EXPO
Washington, DC - USA



One Size Does Not Fit All!

The Diversity & Evolution of QRA Throughout a Project Lifecycle

Safran Risk

Project Controls EXPO

Networking | Education | Opportunities

One Size Does Not Fit All!

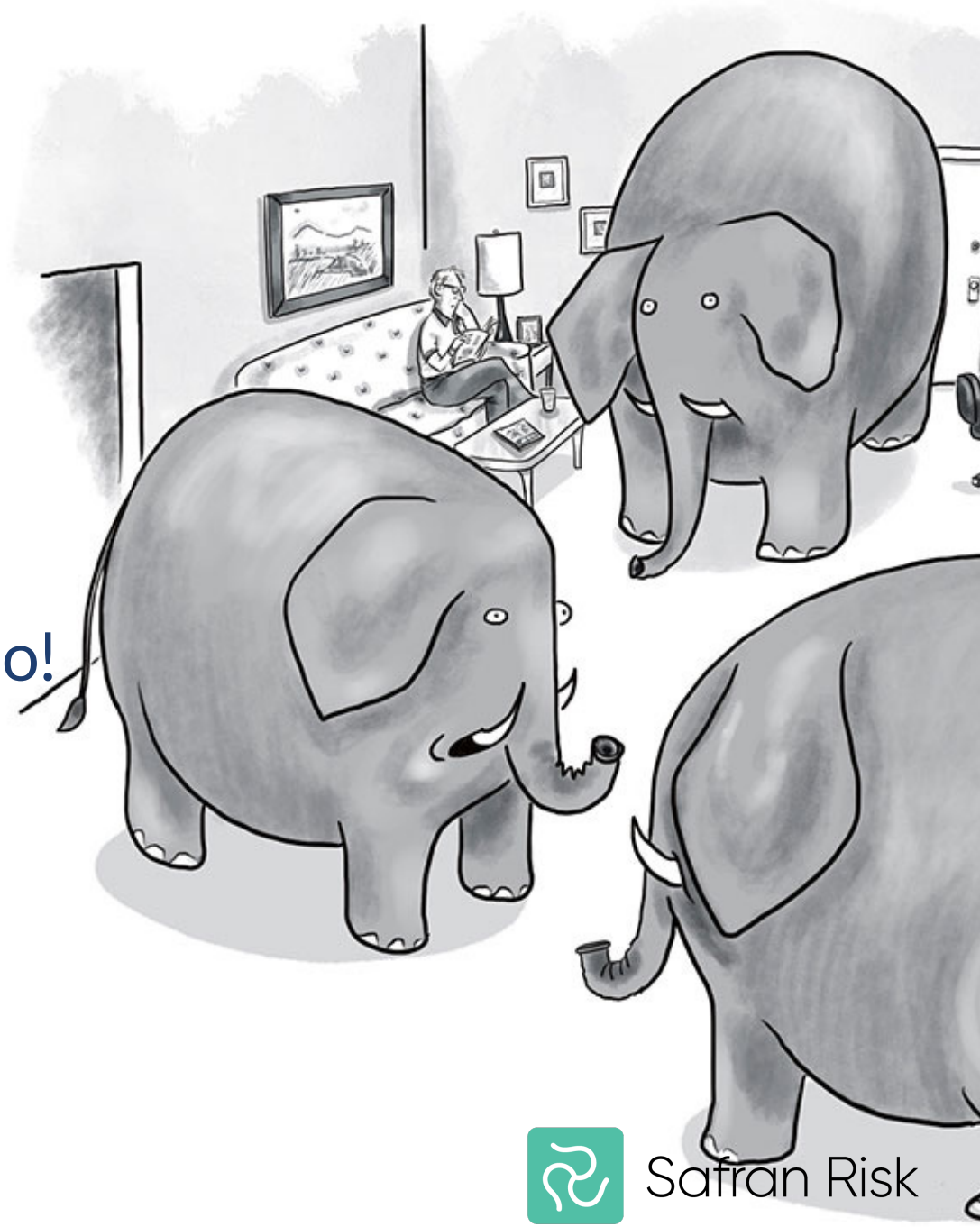
The Diversity & Evolution of QRA Throughout a Project Lifecycle

…Or

All the things that Ai Still Can't Do!

…Or

All the things that you could be doing, but probably aren't!



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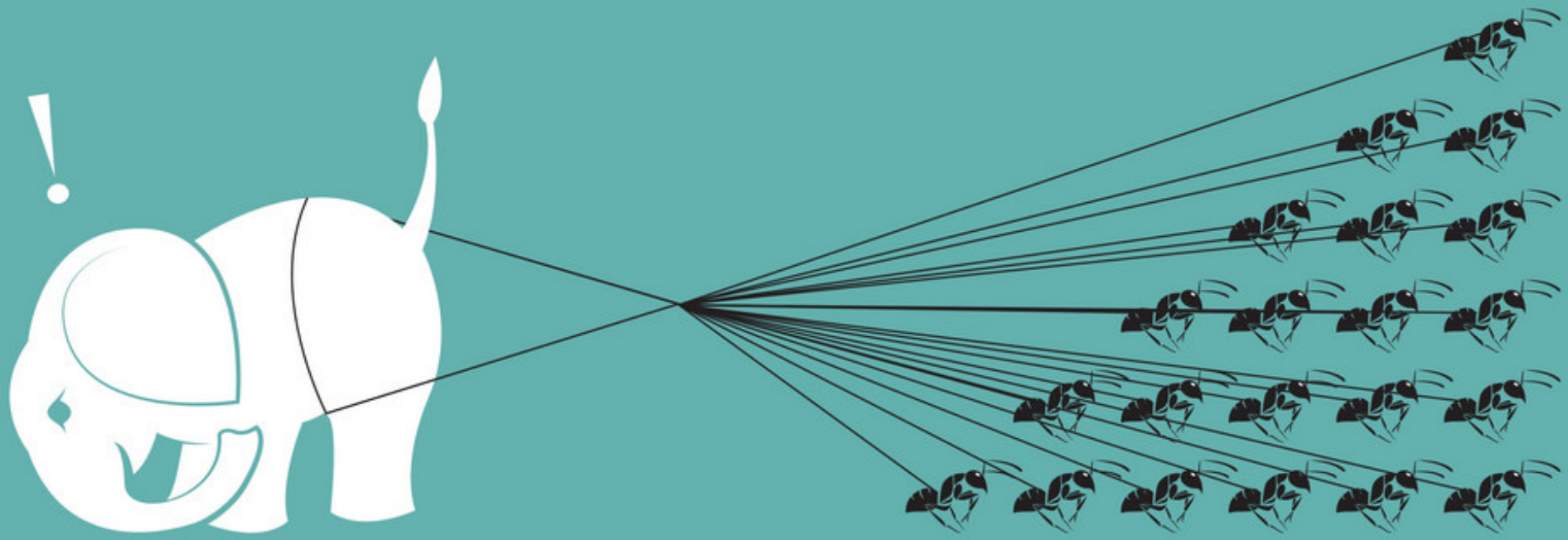
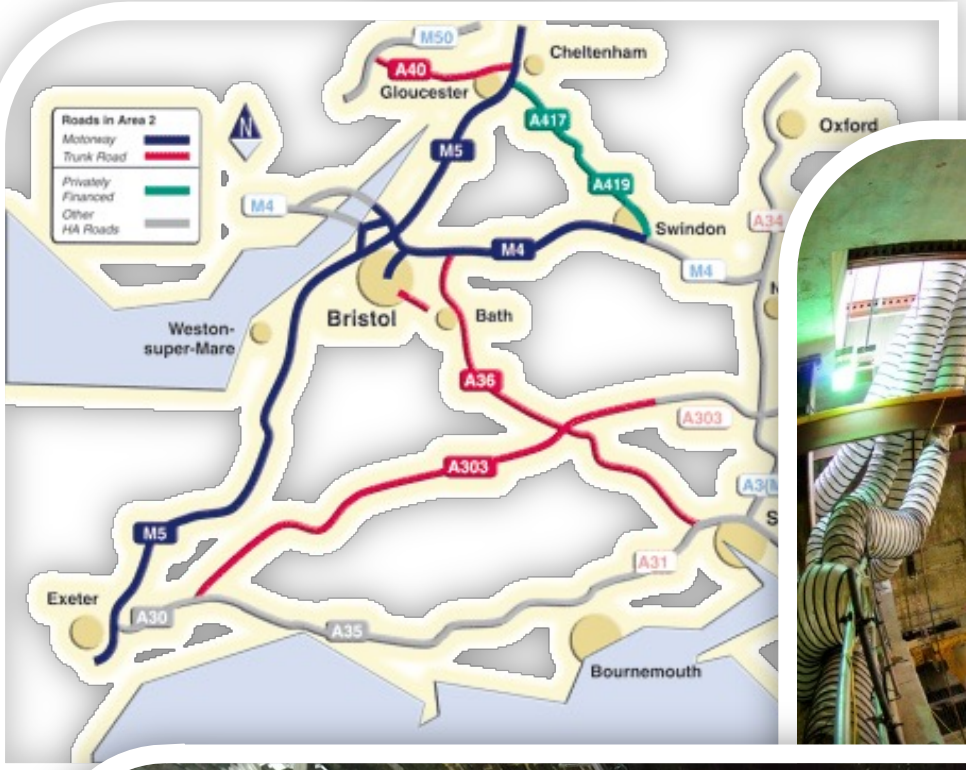
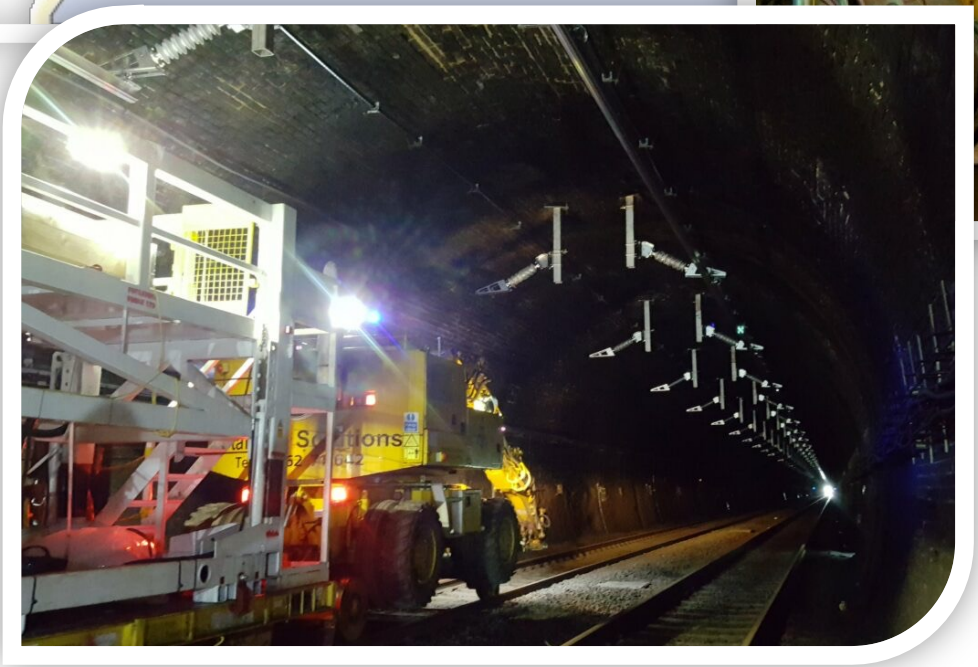
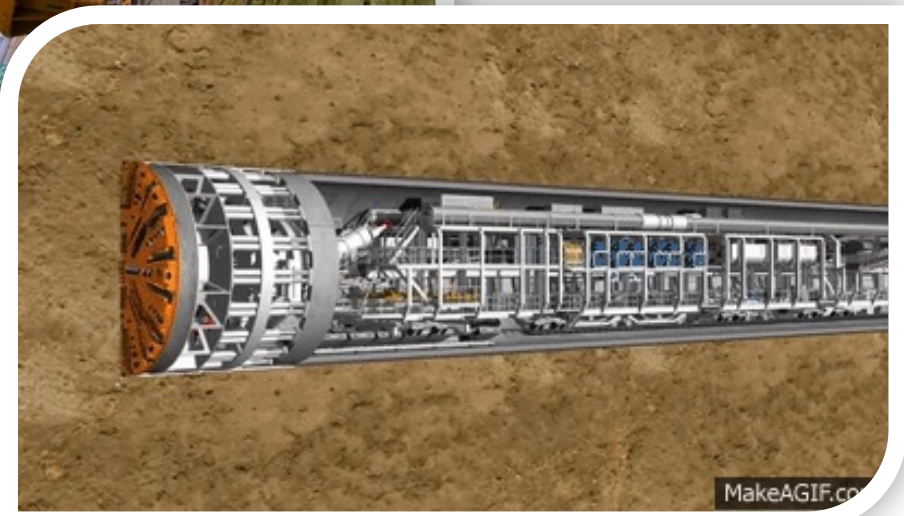
Trade-Offs







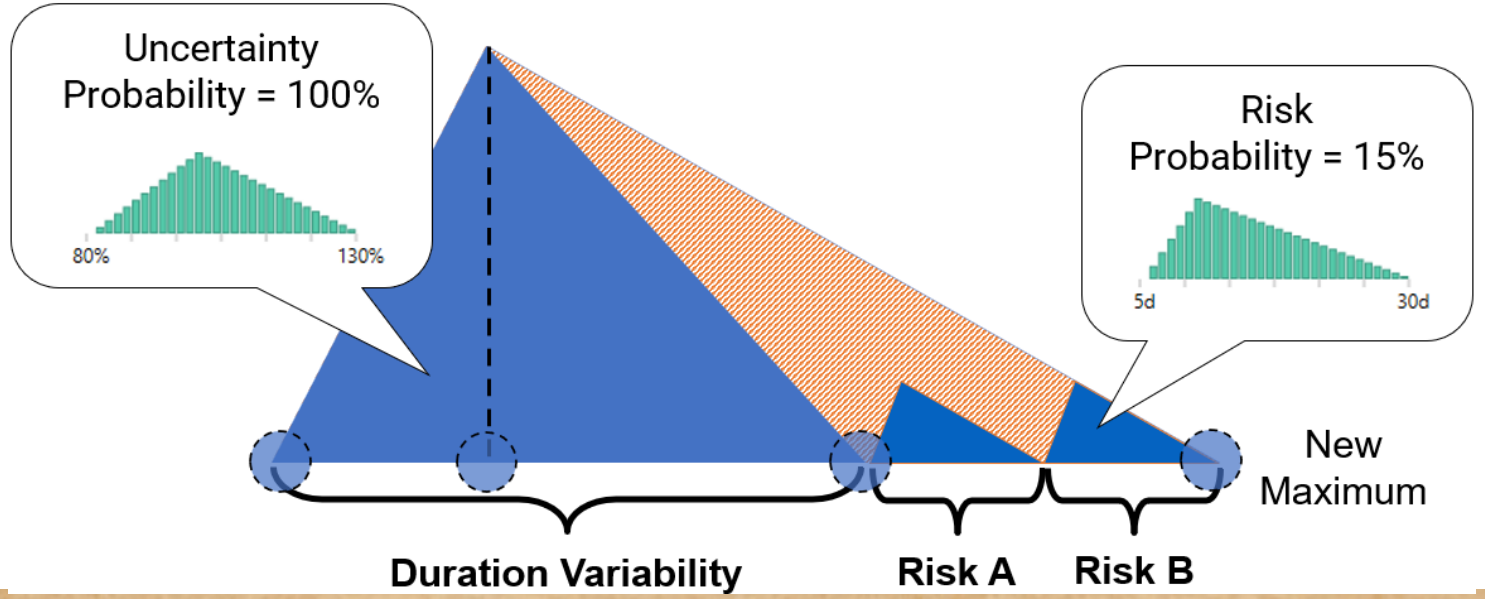


Since 2006

Safran Risk

176d
74d
Frequency
Cumulative Frequency
400
350
300
250
200
150
100
50
0
100% 03.03.23
90% 07.06.22
80% 30.04.22
70% 07.04.22
60% 16.03.22
50% 15.02.22
40% 22.01.22
30% 01.01.22
20% 13.12.21
10% 07.11.21
0% 26.08.21
01.07.21
01.10.21
01.01.22
01.04.22
01.07.22
01.10.22
01.01.23

Winning at QRA!



Quantitative
Risk
Analysis

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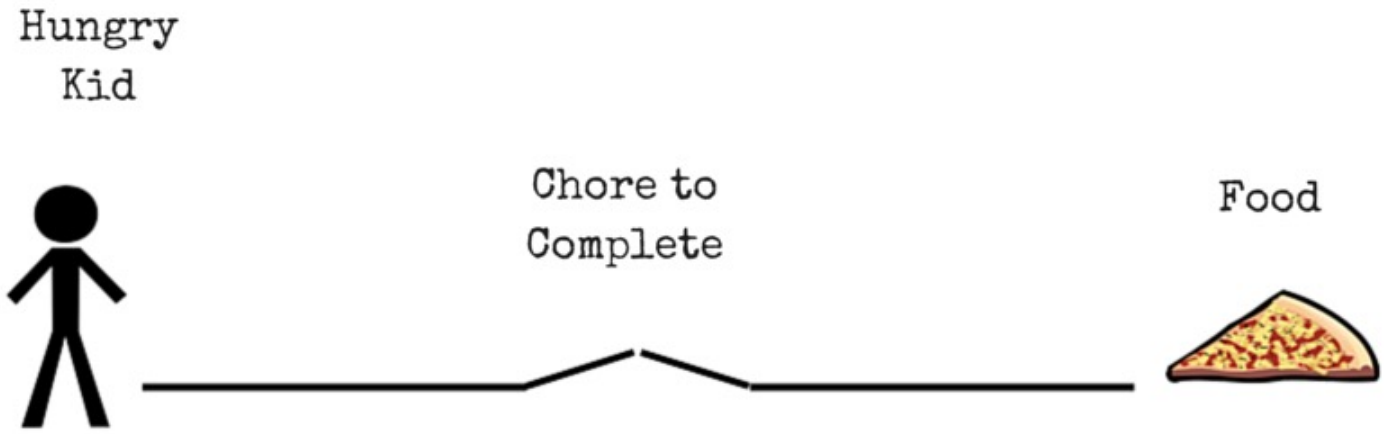
REALITY



2010

Created Consistent Capture of “Actuals”

- Compare Perception of Risk vs. Reality of Risk.

- Proportional Mitigation Recommendations

- Improved Future Estimates

- Lessons Learned & Shared

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2012

Supported a Business Case for Pre-Fab Modules to de-risk a Megaproject

- Positive not Doom
(Risk as a force for Good)

- Genuinely Helped

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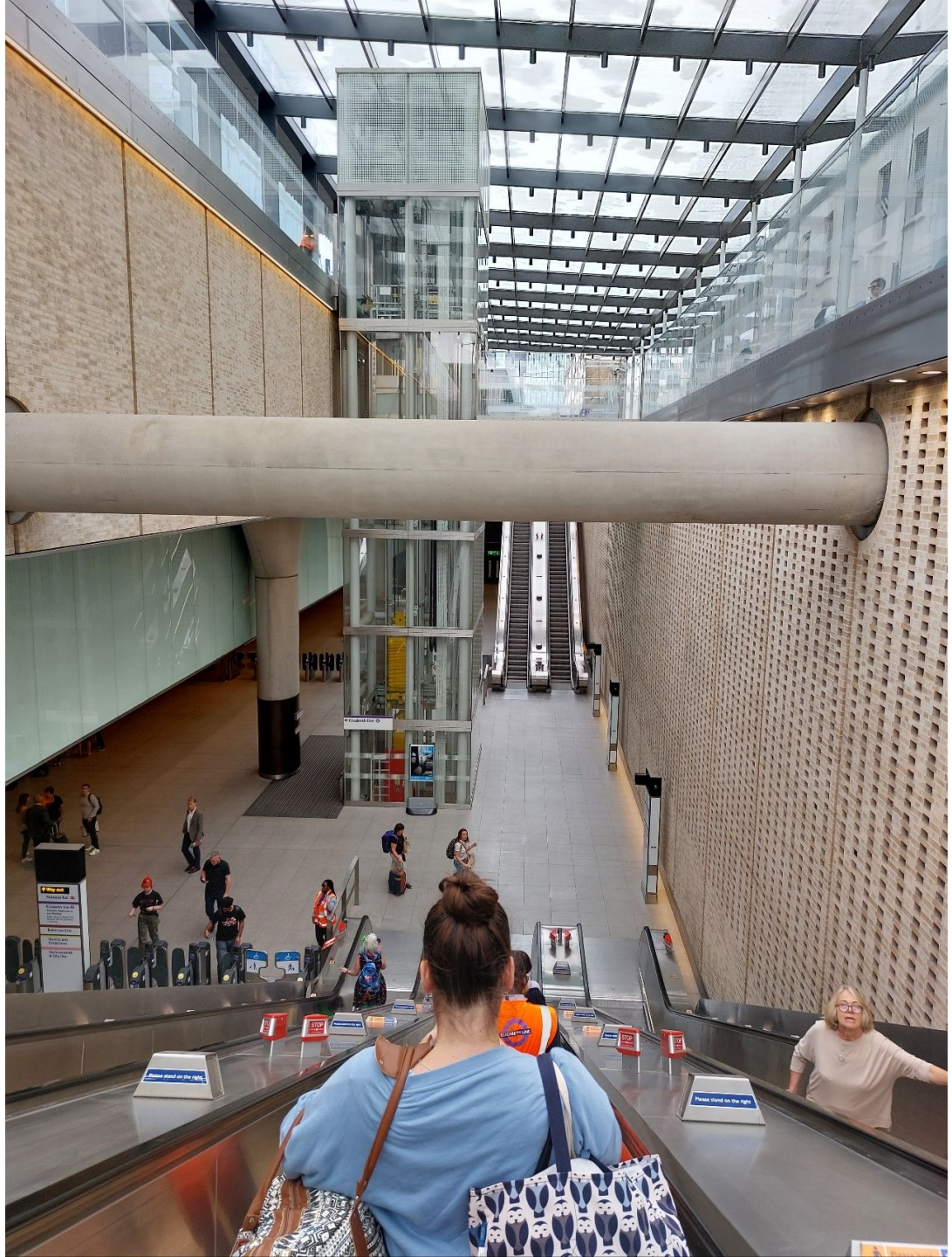
Groundforce Sharco
Freephone 0800 000 345



2013

Justified millions dollars worth of additional contingency via Change Control

“This is unheard-of!”

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2015

QSRA challenged key railway access constraint

- Convinced 3rd Party to re-plan their work

- It was easier than expected

- All parties Win-Win

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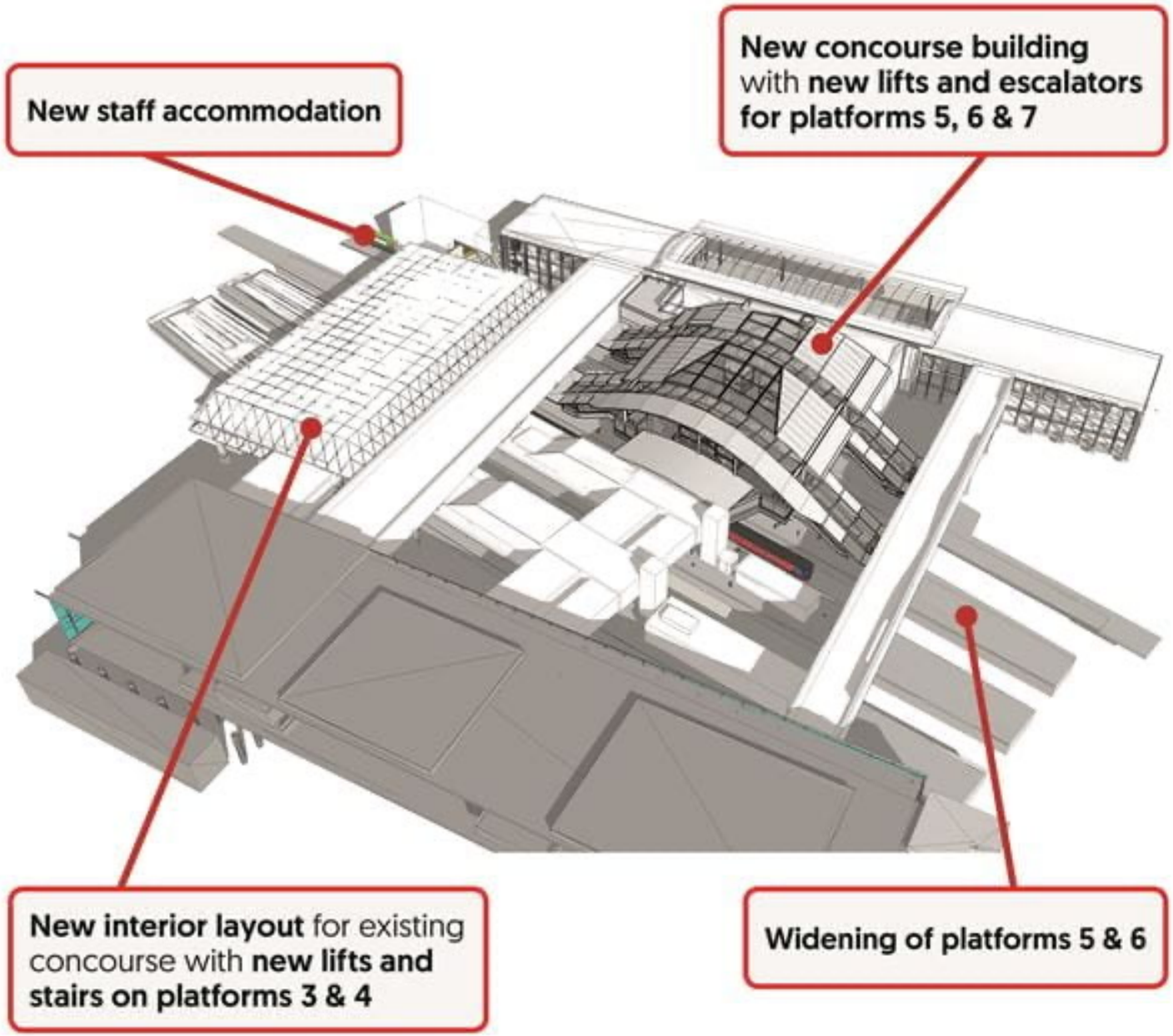

2016

My QRA Fundamentally Challenged the Design of Int. Airport's Railway Station

"Best QRA I've ever seen"

- ECI Phase compared options, to find One that could fit the ridged budget

- Great Collaboration Effort

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2017

Power Law Assisted Program Level QRAs

-

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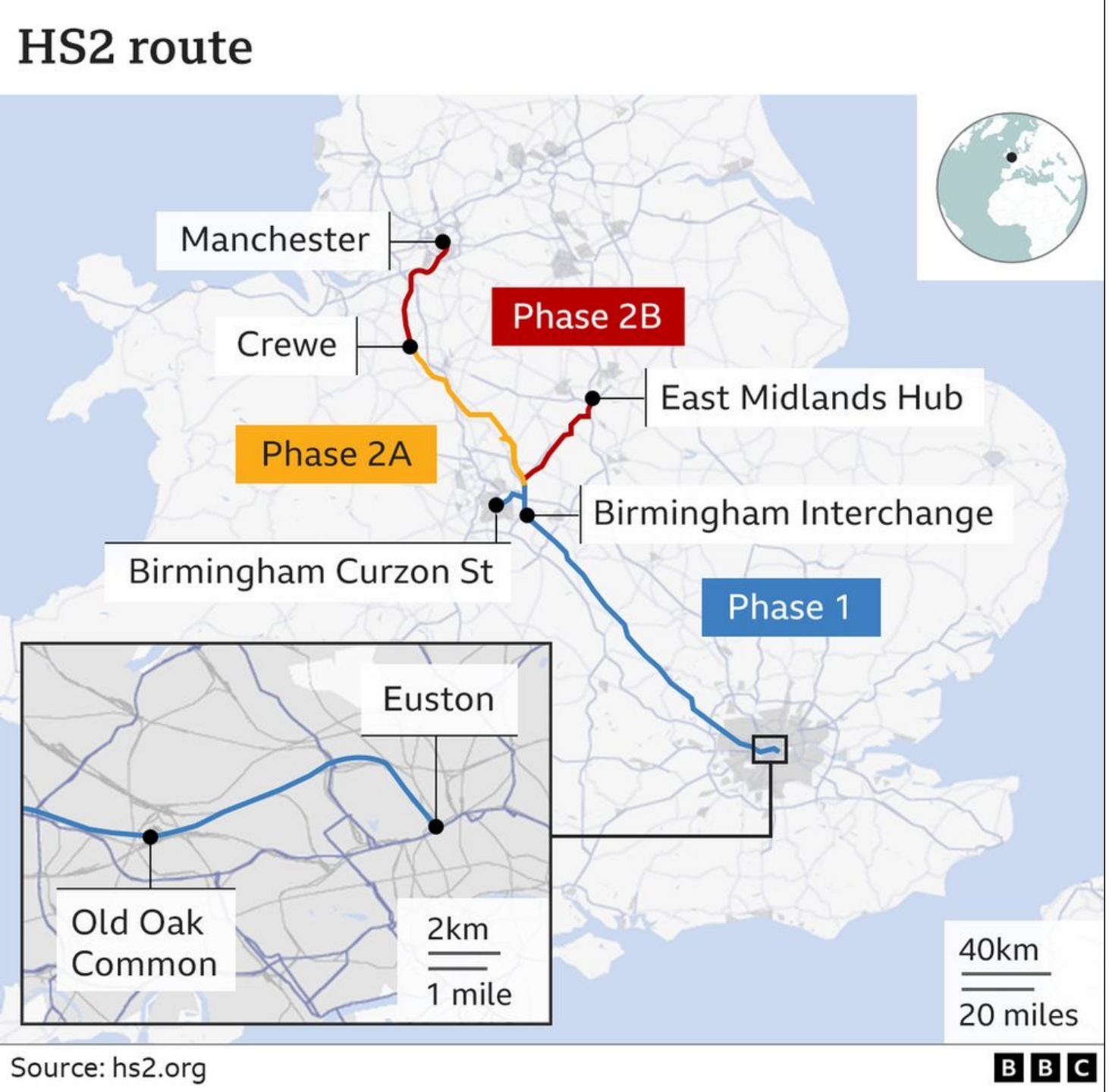

2018

Being **humbled**

- Learning the hard way
That some innovations don't always scale-up!

- Making Mistakes is How we Learn

- Grace & Empathy difficult on megaprojects and polarized

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2019 Discovered Riskiest Works Package was a valid descope option

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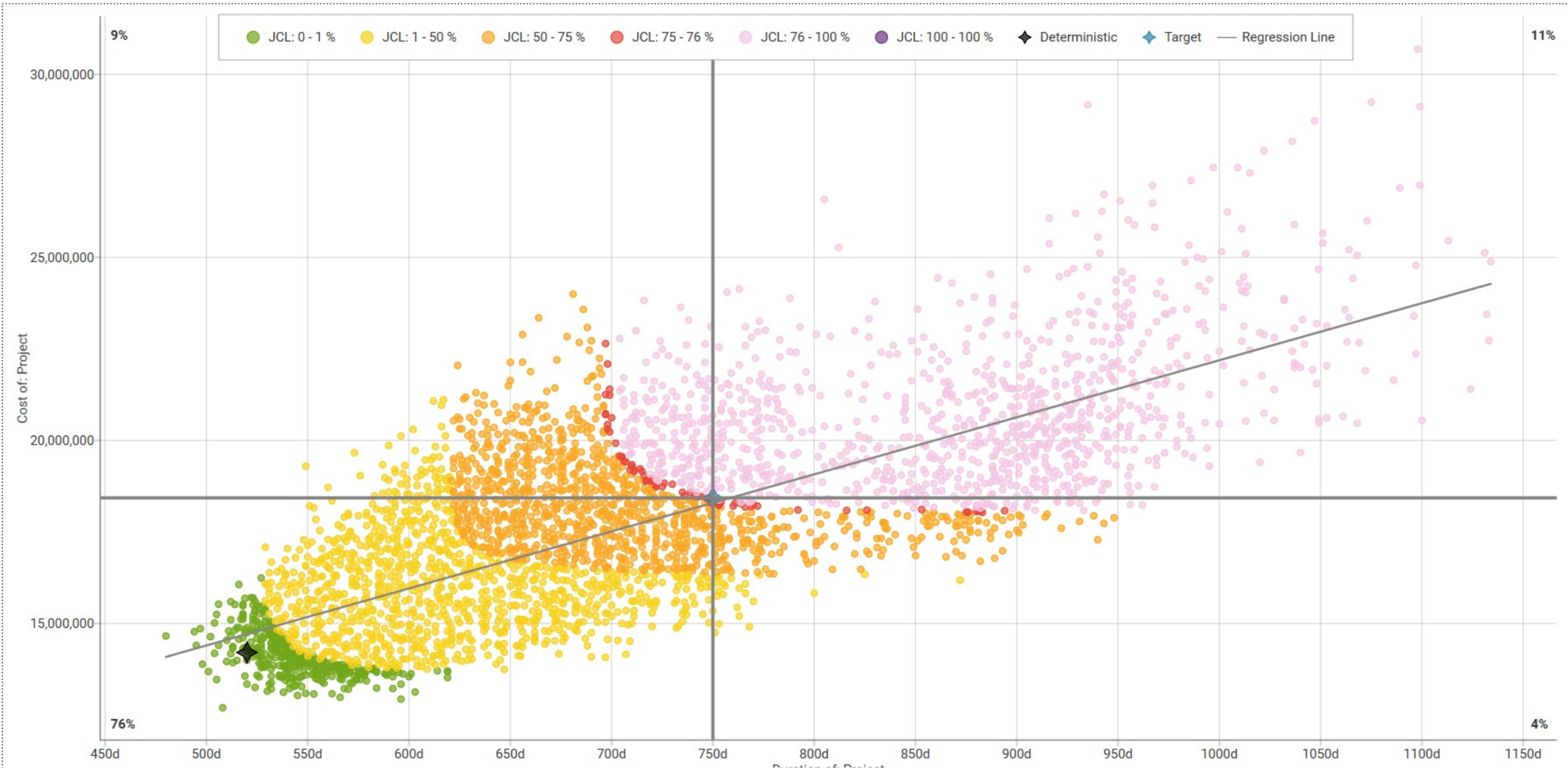
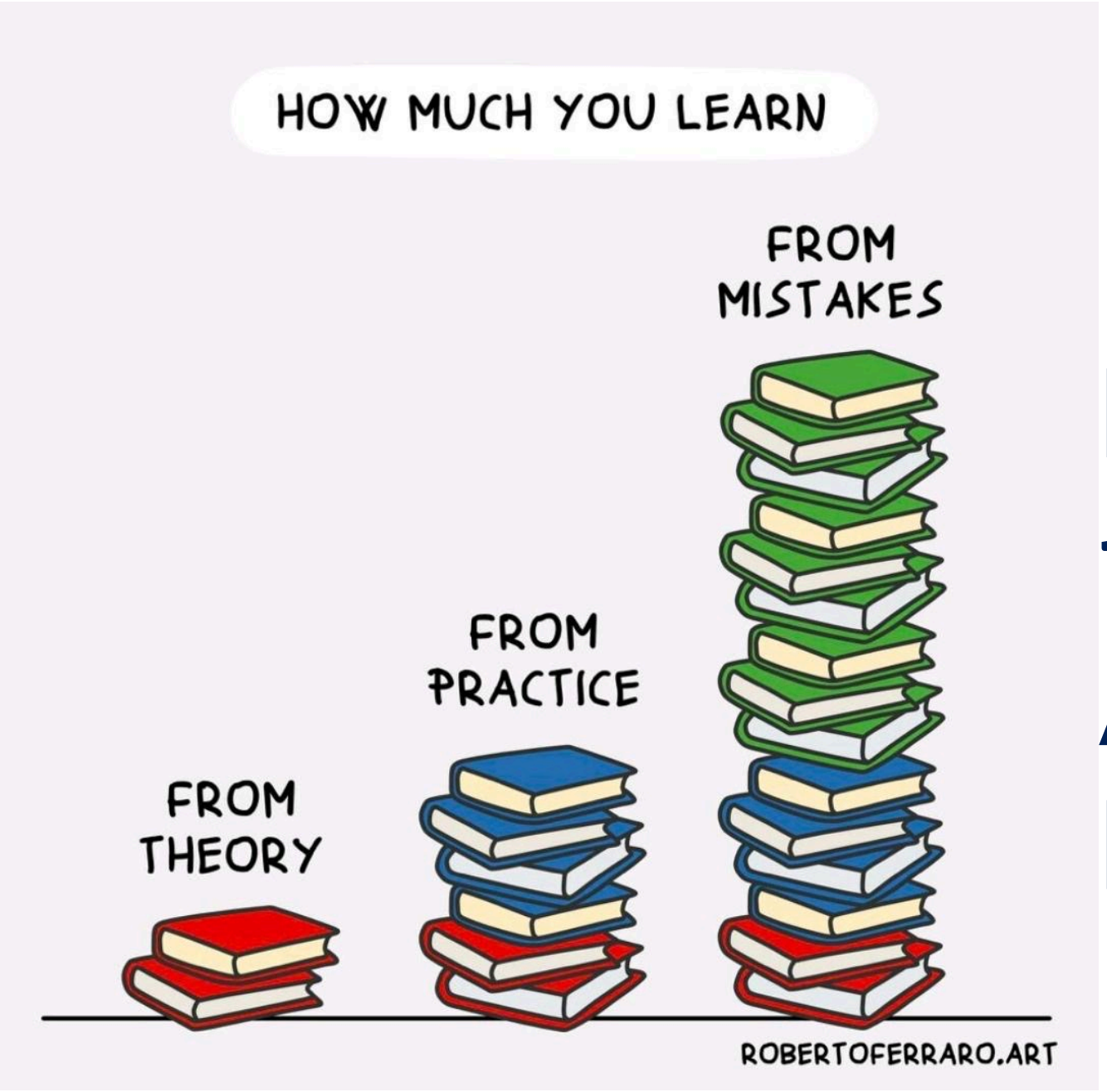


2019 Discovering Safran Risk's alternative approach to ICSRA with CBS + Introducing Joint Confidence Levels (JCL)

Safran Risk



How many of my highlights do you think a Forecasting Ai system would have helped?

Safran Risk

“Stable World Principle”

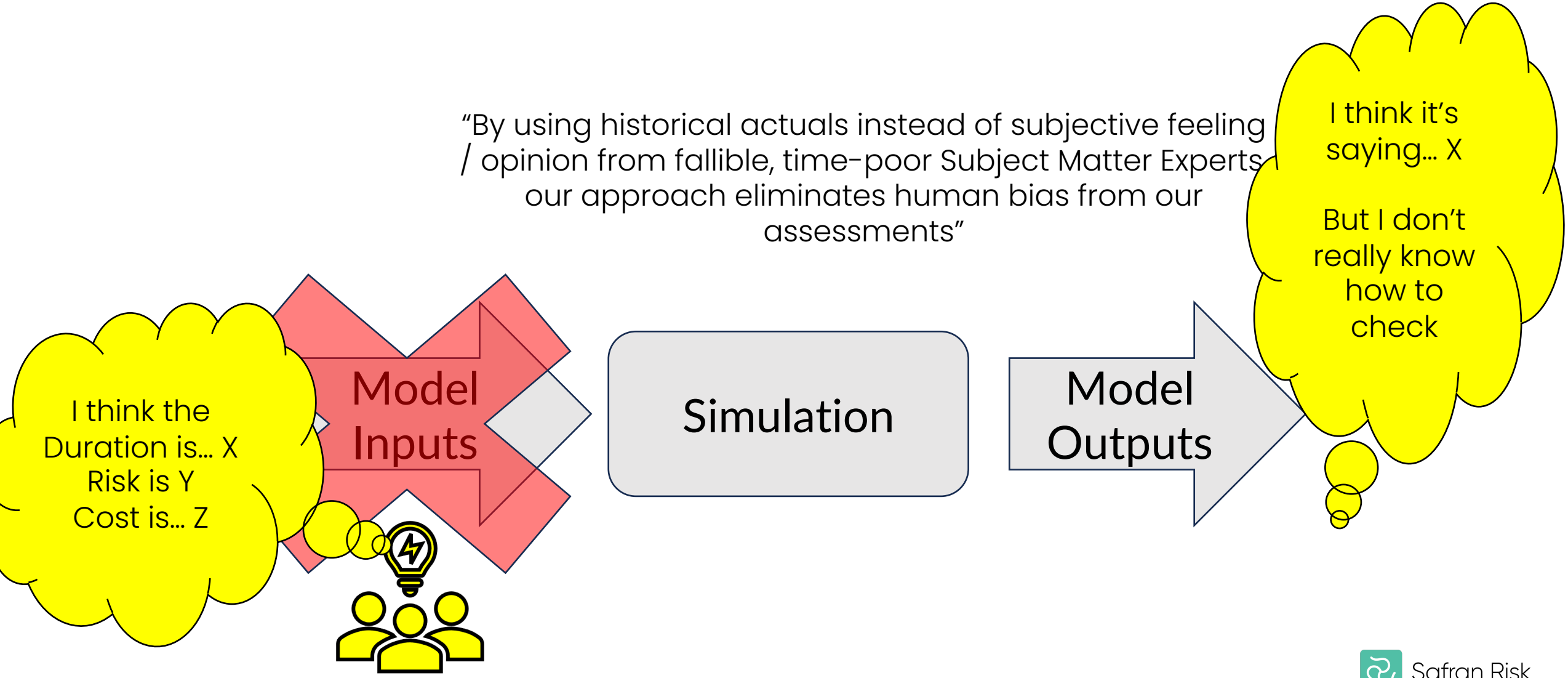
Many Ai systems are designed to do 1 thing really well!

Whereas, in my career I had been tasked with answering different questions within different contexts that would be completely unfamiliar to a robot.

Like any machine, if you try operating them outside of their specified parameters, like an urban car going off-road, or in the water, then you are going to undermine or break that machine as it can’t handle variation of circumstance.

Reality Check

"By using historical actuals instead of subjective feeling / opinion from fallible, time-poor Subject Matter Experts our approach eliminates human bias from our assessments"



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Do Minimum / Restrained QRA !

=

P-Value

+

Top 10 Tornado

= **Limited Value**

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Necessity, is the mother of invention.

I don't think there's a textbook for this. These are just the things I could imagine, based off my actual experiences!!!

Someone asks:
"We need to 'prove or disprove X' but we don't know how?"

Me:
"Have you thought about building a toy model to represent it? Then we stress-test solutions & approaches! No?
- OK, let me help you!"

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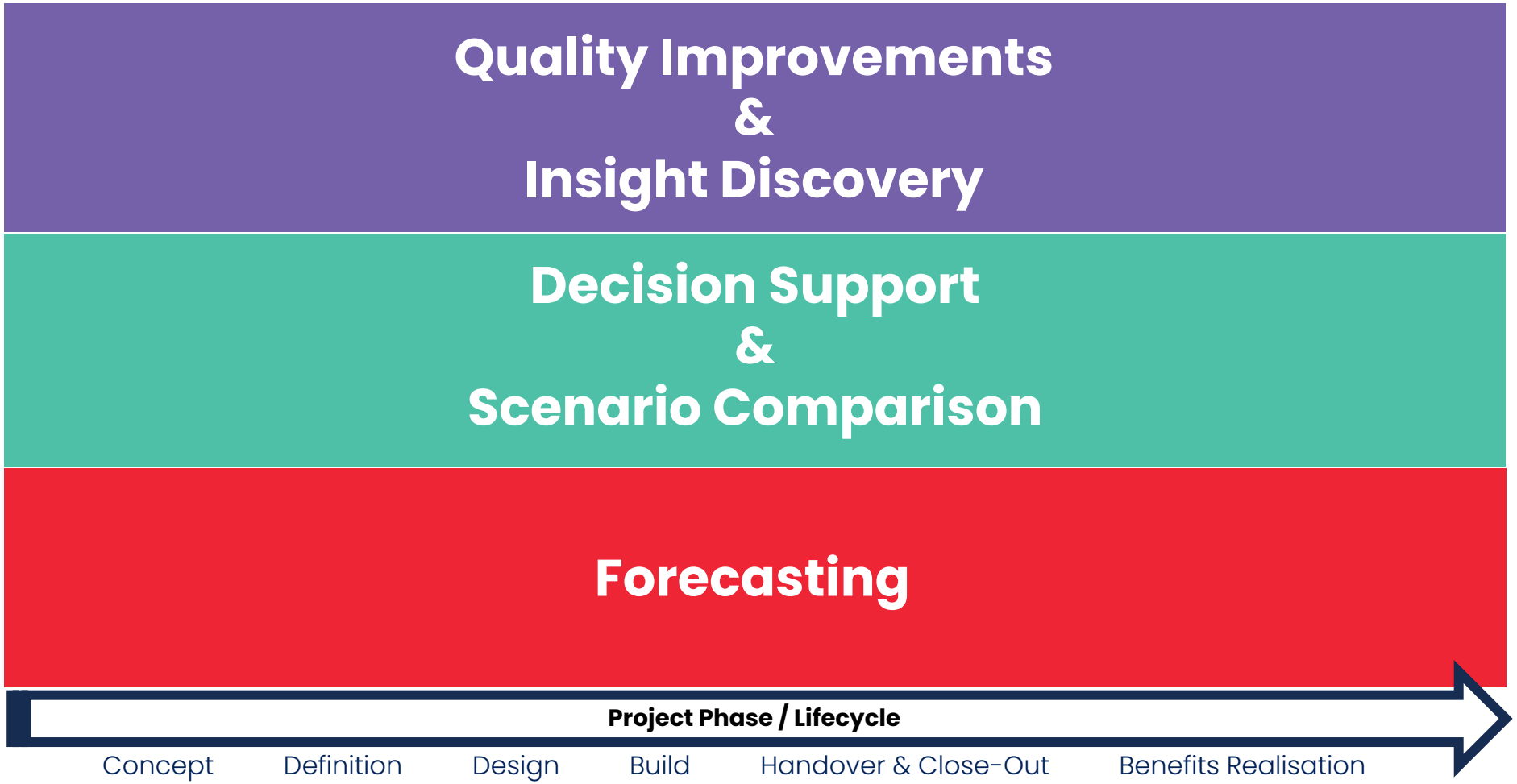
QRA - OUTCOMES



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OUTCOMES

QRA Use Cases

Forecasting

Integrated Cost Schedule Risk Analysis Joint Confidence Level (JCL)

Remaining Contingency Stress Testing & Actual Progress / Performance Extrapolation

Expected vs. Risk Adjusted vs. Change Managed Future Revenue Models (Owner Operator) + Contractor Profit/Loss

Project Behaviour Anticipation via Conditional/Probabilistic Branching

Contingency Discovery & Validation / Setting

Delay Penalty Exposure

Inflation / Escalation + Prolongation Calculations

Disallowable Cost Exposure

Hybrid Parametric + ICSRA (Integrated Cost & Schedule Risk Analysis)

Project Phase / Lifecycle

Concept | Definition | Design | Build | Handover & Close-Out | Benefits Realisation

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OUTCOMES

QRA Use Cases

Decision Support & Scenario Comparison

- Systemic Risk & Correlation Stress Testing
- Manufacturer Warranty Period vs. Delayed Contractor Handover (Misaligned Liability Negotiations)
- Scope & Method Optioneering
- Change Management & Opportunity Validation
- Weather Downtime Modelling & Climate Scenario Testing
- Contingency Discovery & Validation / Setting
- Programme Recovery / Acceleration Cost Benefit Analysis Stress Testing
- Expected vs. Risk Adjusted vs. Change Managed Future Revenue Models (Owner Operator) + Contractor Profit/Loss
- Contractor Handover Delay Exposure & Date Negotiation
- Project Behaviour Anticipation via Conditional/Probabilistic Branching

Project Phase / Lifecycle

Concept | Definition | Design | Build | Handover & Close-Out | Benefits Realisation

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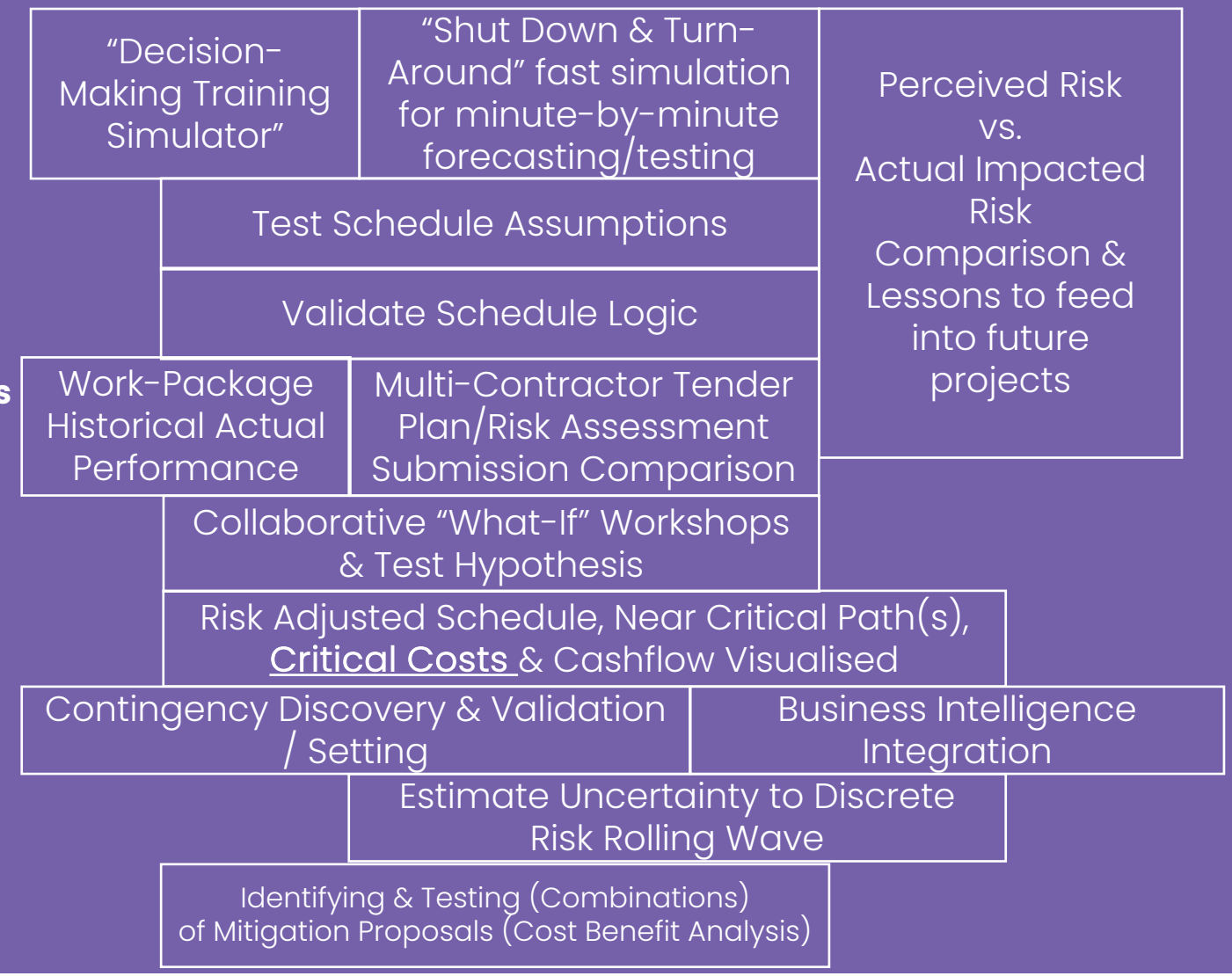
OUTCOMES

QRA Use Cases

Quality Improvements & Insight Discovery



Project Phase / Lifecycle

Concept | Definition | Design | Build | Handover & Close-Out | Benefits Realisation

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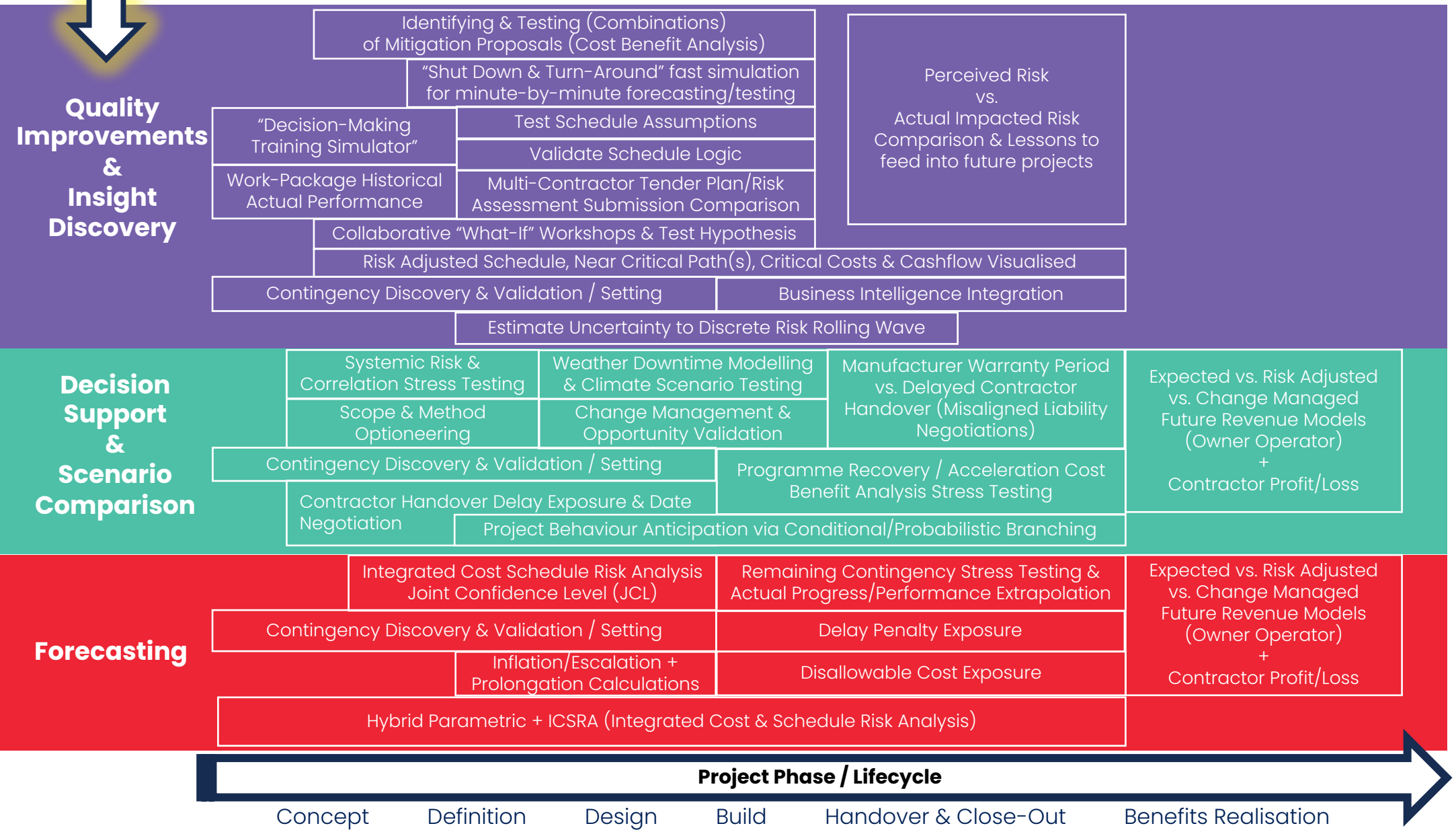
OUTCOMES QRA Use Cases



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Batman Utility Belt

Because a regular belt's too mainstream

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New Algorithmic Risk Analysis

FAST - Closed System

Raw Data → Data Processing → Low-Context Advice & Patterns Spread Across Many More Things (requires distributed/delegated decision authority)

Are you Sure about Beep-Boop-Beep ?

ONE SIZE DOES NOT SIMPLY

Traditional Quantitative Risk Analysis

SLOW – Open System

Flawed Data → Opinion Processing → High-Context Decisions On Specifically Fewer Things = Actionable within existing/typical governance structures

Then we'll do 1, 2, 3

This will hurt / help because of X, Y & Z

FIT ALL

imgflip.com

CONCLUSIONS

All models are wrong

but some are useful

George E.P. Box

This remains true of both Traditional QRA and Ai that's trained on poor quality inconsistent data

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Key Take-Aways

- QRA can be used in more ways than most people realize
- Ai (currently) can only do 1 or 2 of the 20+ things listed
- There's more value hidden in the collaboration than the QRA outcome

Do what you can, with what you have, to answer specific, targeted questions.

Help your colleagues with what matters to them

(Don't fixate on contractual requirements)!

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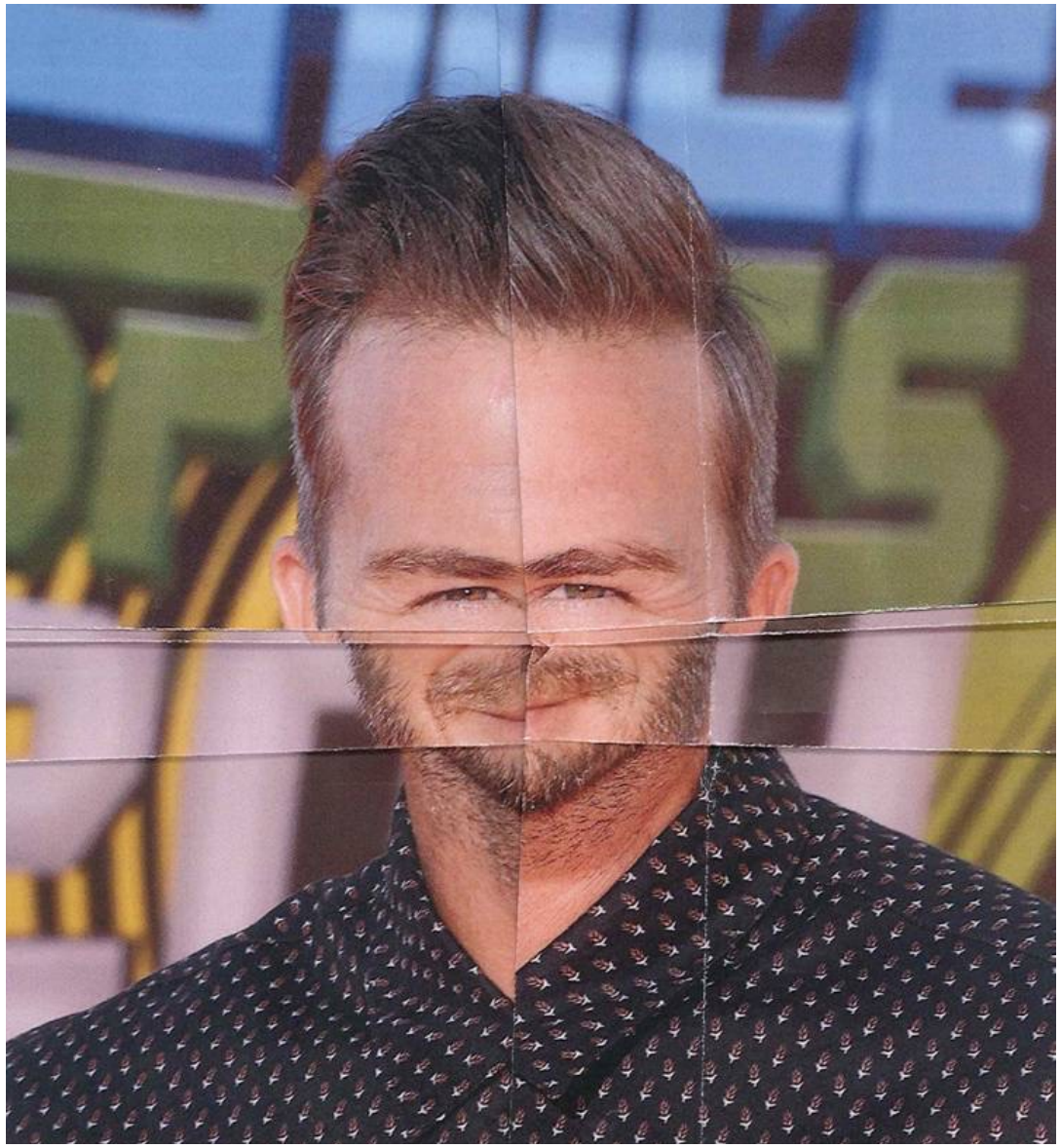
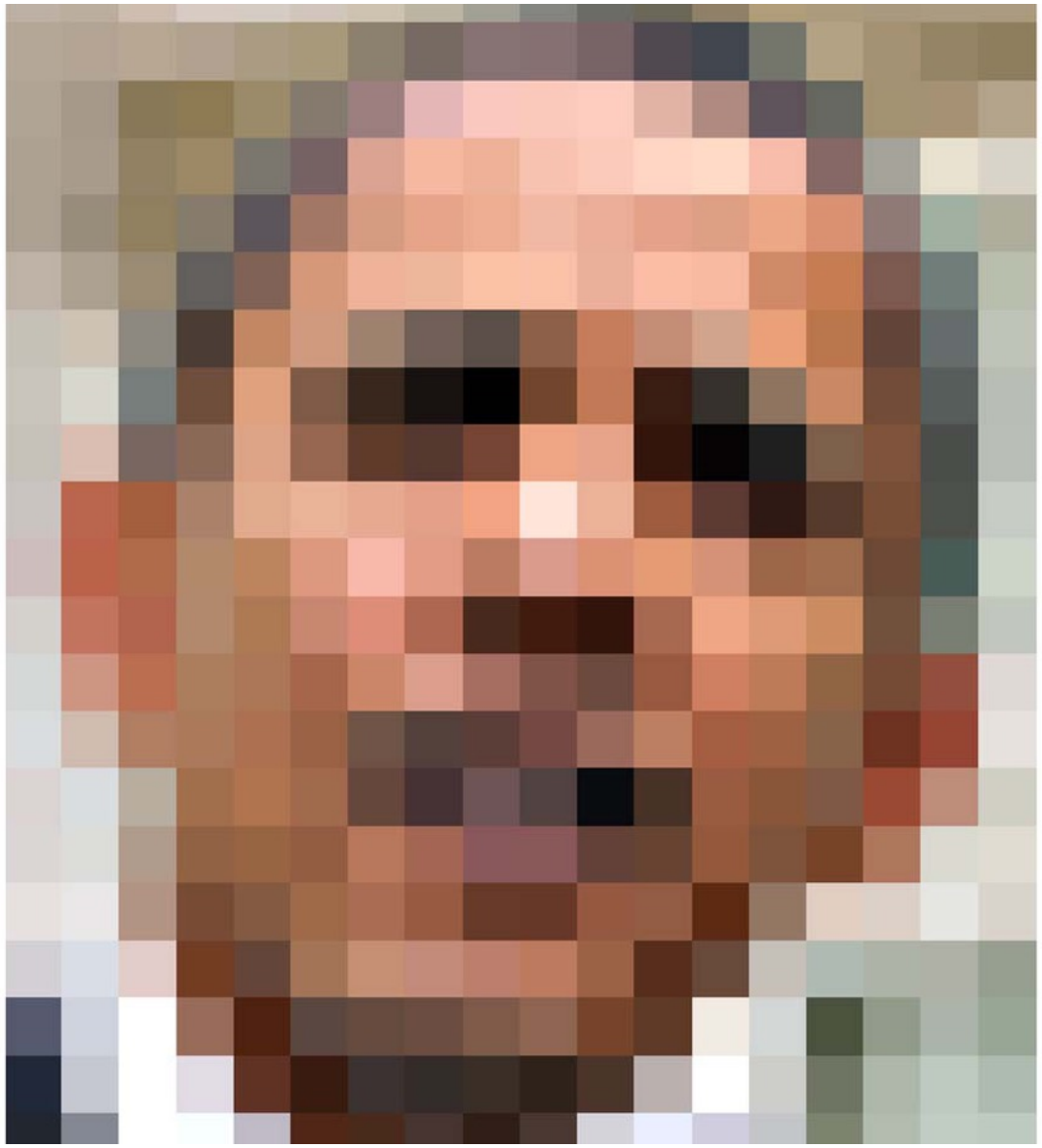
Time for Questions?

I've got some for you!

You can recognize these famous faces on only a small fraction of the full data!



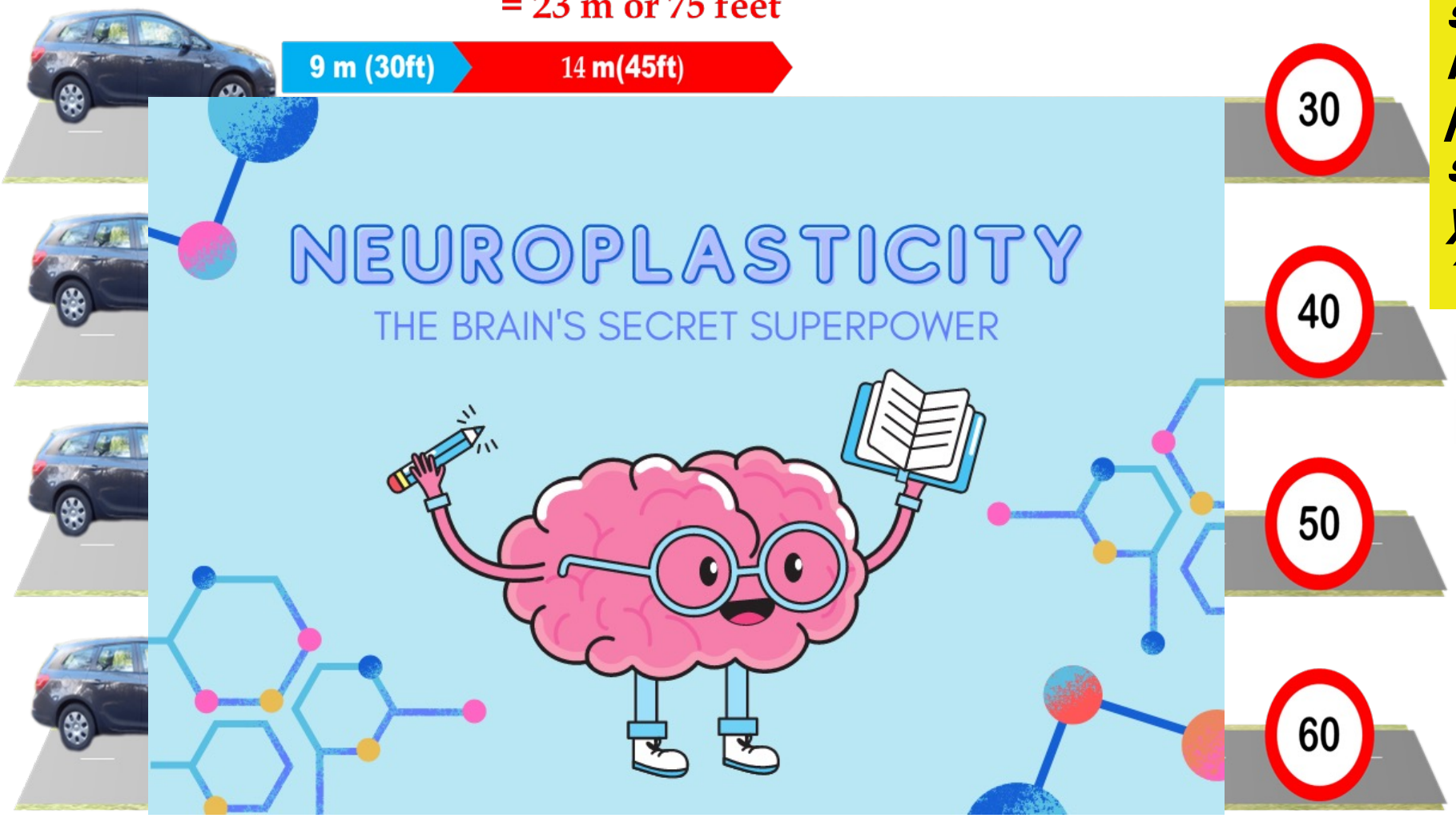


Thinking | Braking

Unconscious Reaction?

= 23 m or 75 feet

9 m (30ft) | 14 m(45ft)



30 40 50 60

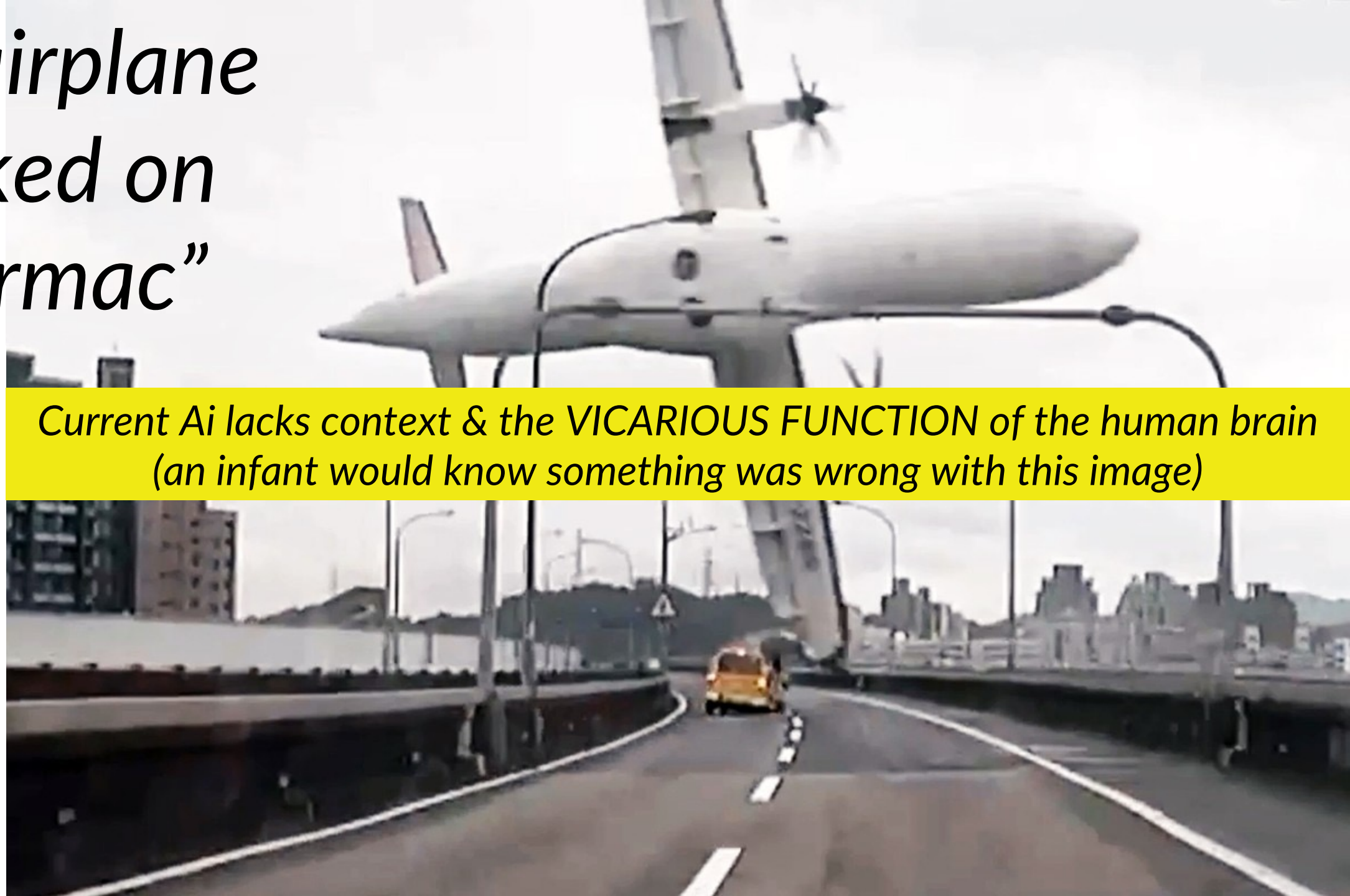
= 96 m or 315 feet

21 m (70ft) | 75 m (245ft)

70

Humans often learn skills and instincts not just by sheer practice & memory, but by wiring different parts of their nervous systems together! All of your senses combine into "gut-feeling" & intuition!

“The airplane is parked on the tarmac”



Current Ai lacks context & the VICARIOUS FUNCTION of the human brain (an infant would know something was wrong with this image)

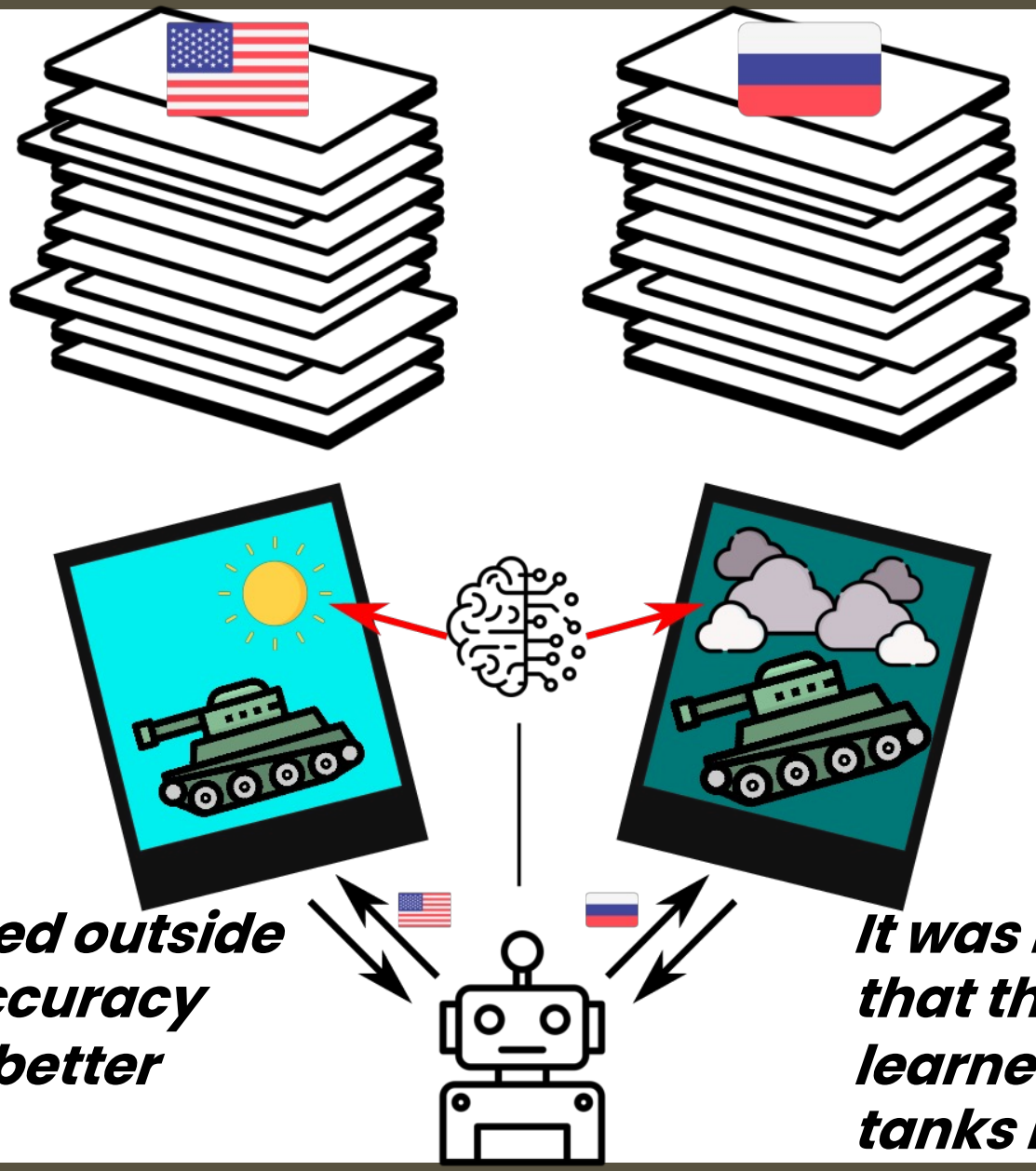
*Gravity
*Orientation
*Momentum
*Public Space
*Dashcam
*Emergency Breaking

#CONTEXT SENSING

The Russian Tank Fallacy

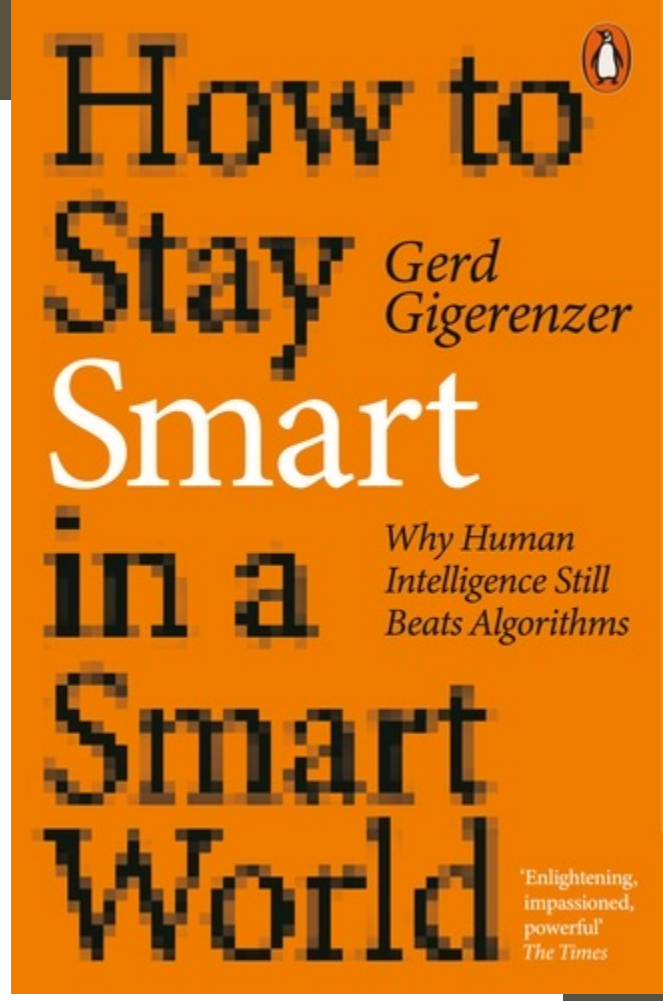
Possibly an Urban myth but the message of the story is valid.

Supposedly an algorithm was trained by the US Army to 99%+ accuracy of identifying Friendly tanks.

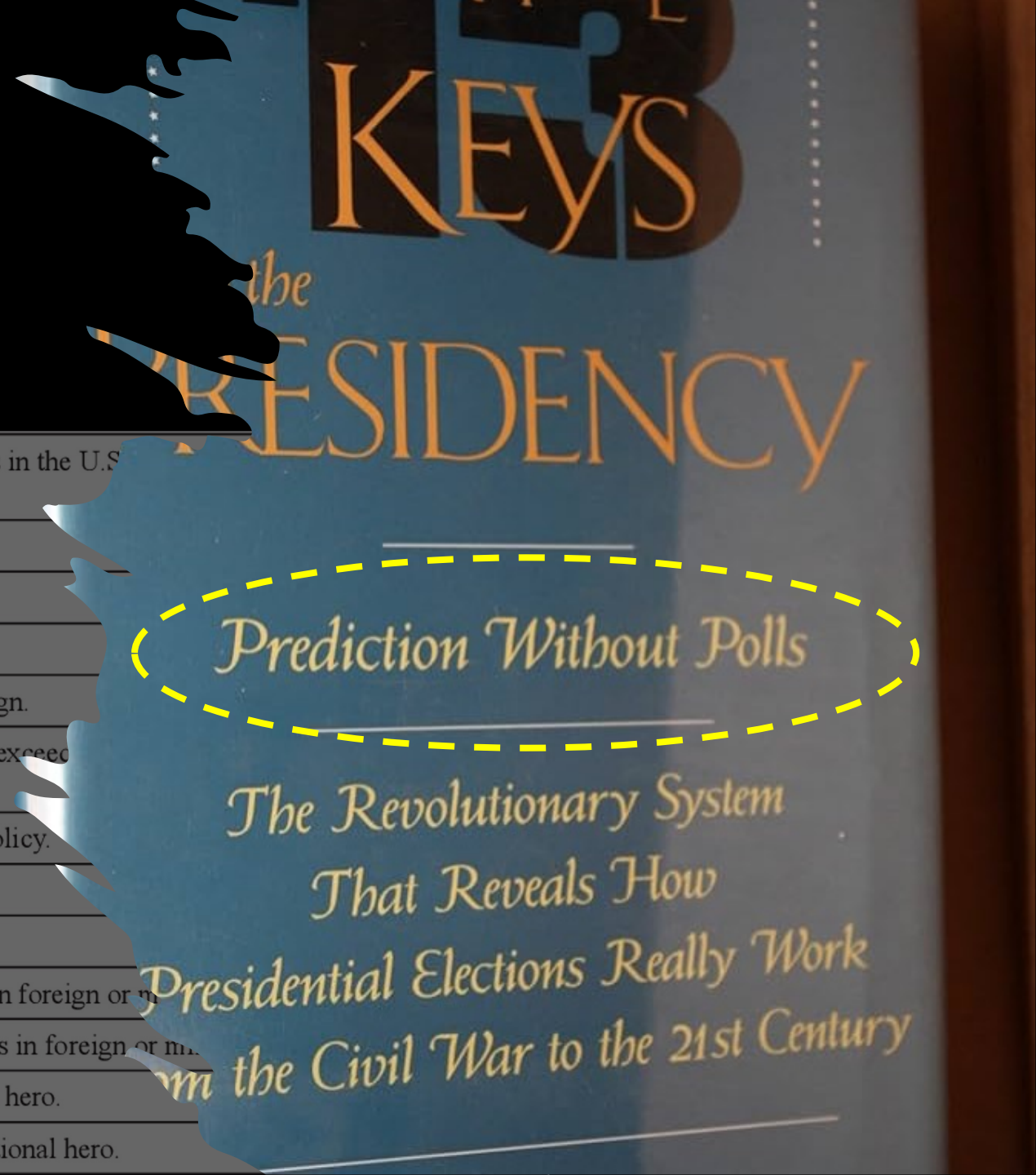


However, when tested outside of lab conditions, accuracy dropped to 50% no better than flipping a coin.

It was later discovered that the algorithm had learned to identify US tanks by glossy marketing photos!



The 13 Keys To the White House (Heuristic)

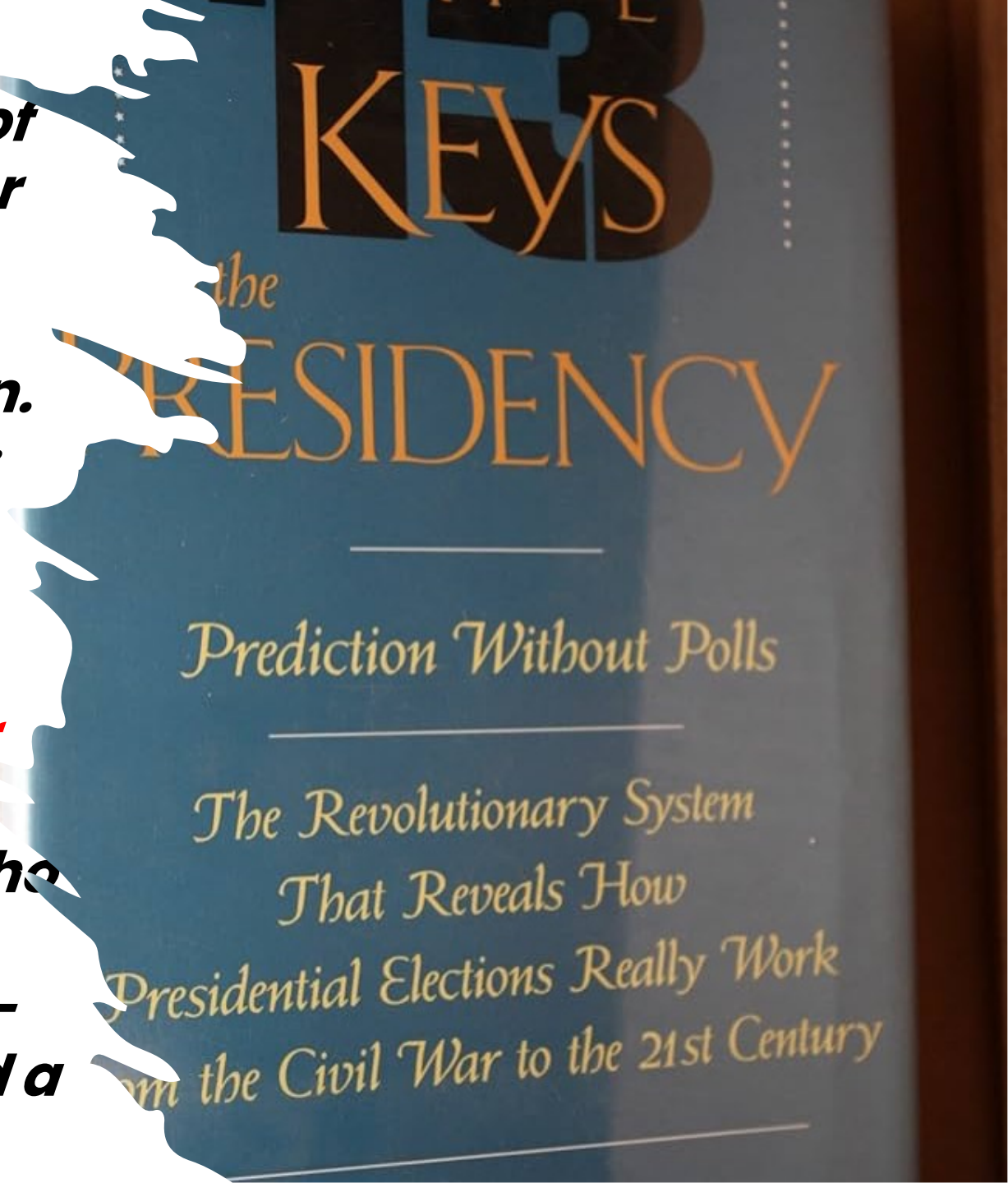


KEY 1 (Party Mandate): After the midterm elections, the incumbent party holds more seats in the U.S did after the previous midterm elections.
KEY 2 (Contest): There is no serious contest for the incumbent-party nomination.
KEY 3 (Incumbency): The incumbent-party candidate is the sitting president.
KEY 4 (Third party): There is no significant third-party or independent campaign.
KEY 5 (Short-term economy): The economy is not in recession during the election campaign.
KEY 6 (Long-term economy): Real per-capita economic growth during the term equals or exceed terms.
KEY 7 (Policy change): The incumbent administration effects major changes in national policy.
KEY 8 (Social unrest): There is no sustained social unrest during the term.
KEY 9 (Scandal): The incumbent administration is untainted by major scandal.
KEY 10 (Foreign/military failure): The incumbent administration suffers no major failure in foreign or m
KEY 11 (Foreign/military success): The incumbent administration achieves a major success in foreign or mi
KEY 12 (Incumbent charisma): The incumbent-party candidate is charismatic or a national hero.
KEY 13 (Challenger charisma): The challenging-party candidate is not charismatic or a national hero.

"Lichtman's was one of the rare dissenting voices among the mass of experts who predicted a clear win for Clinton.

HE PREDICTED THAT Trump would win. It was not the first time he was right; he had predicted all elections correctly since 1984.

His method does not rely on number crunching with big data, nor ...probabilities... it simply predicts who will win (where the more) 'yes' answers to the questions favours re-election of the incumbent party, and a 'no' does not."



THANK YOU

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