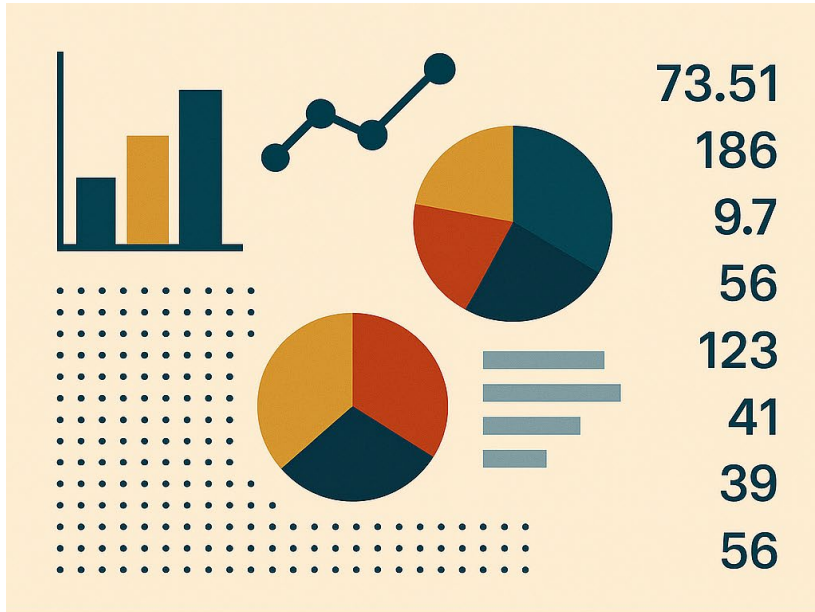


Grokking the Data, Hearing Each Other: Fostering Scholarly Dialogue Through Sound Statistics and Civil Discourse

Seán Lacey
Research Integrity & Compliance Officer

 [0000-0003-3005-6294](#)

Grokking the Data, Hearing Each Other



Integrity in research demands two disciplines:

1. Rigorous analysis,
2. Respectful dialogue.

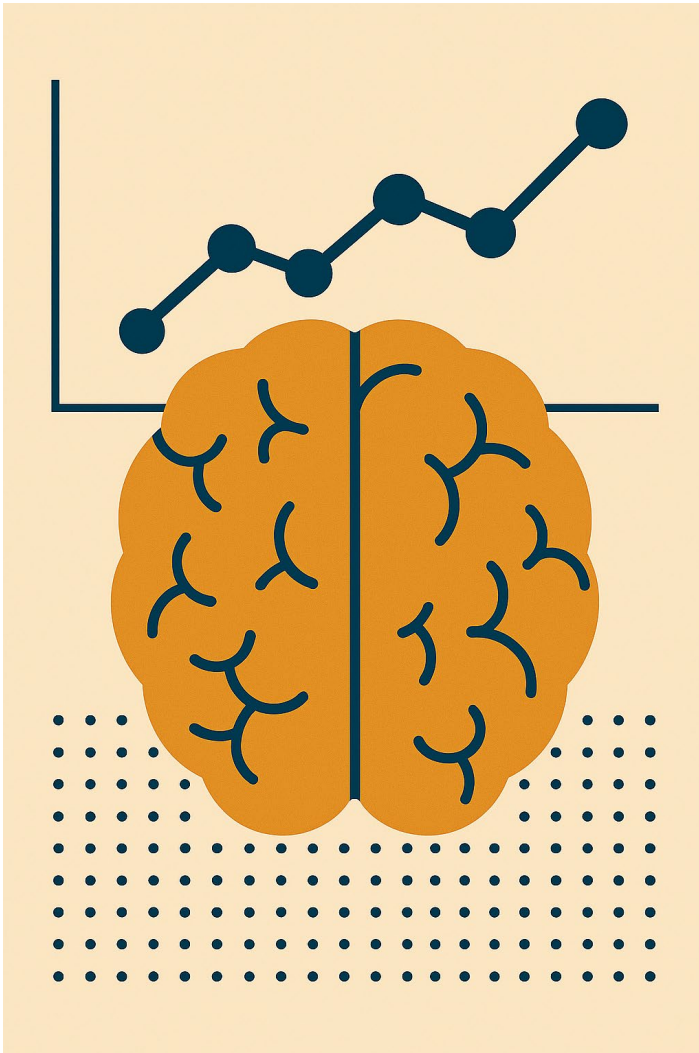
Why This Matters

Data is not just numbers.

Interpretation matters.



What Does it Mean to “Grok” Data?



Deep vs. surface understanding.

Common pitfalls

- Confirmation bias,
- Cherry-picking,
- Ignoring context.

Methods

- Exploratory Data Analysis,
- Visualisation,
- Domain knowledge.

What Does it Mean to “Grok” Data?



Peng, B. (2017). Below the iceberg’s surface.
<https://bopeng.io/below-the-iceberg-surface/>

Common Pitfalls in Data Interpretation

MISREAD DATA	CORRECT INTERPRETATION
The trend is declining.	There's a slight decrease.
It's only 15% –not too many.	That's 150 out of 1,000 people.
These are all separate events.	These could be related.
No one reported any issues.	Only 10% responded
It doubled from 2 to 4.	The sample size is small.



Statistical Dilemma 01

You are doing research in cooperation with a prestigious private partner. During the process, however, you discover that this partner has a secret agenda. They deliberately use your research to their own advantage by prioritising outcomes advantageous to their own agenda whilst neglecting other results that could contradict these positive outcomes.



What do you do?

- A. You do nothing; the private partner can decide how to deal with the results, and you do not want to put this project in jeopardy. **3%**
- B. You request a meeting with the partner to address this issue and to explain the importance of the independence of science. **44%**
- C. You withdraw from the research, to safeguard your academic reputation. **11%**
- D. You discuss what to do with the head of research of your department. **42%**

Planning for Integrity: The Statistical Analysis Plan

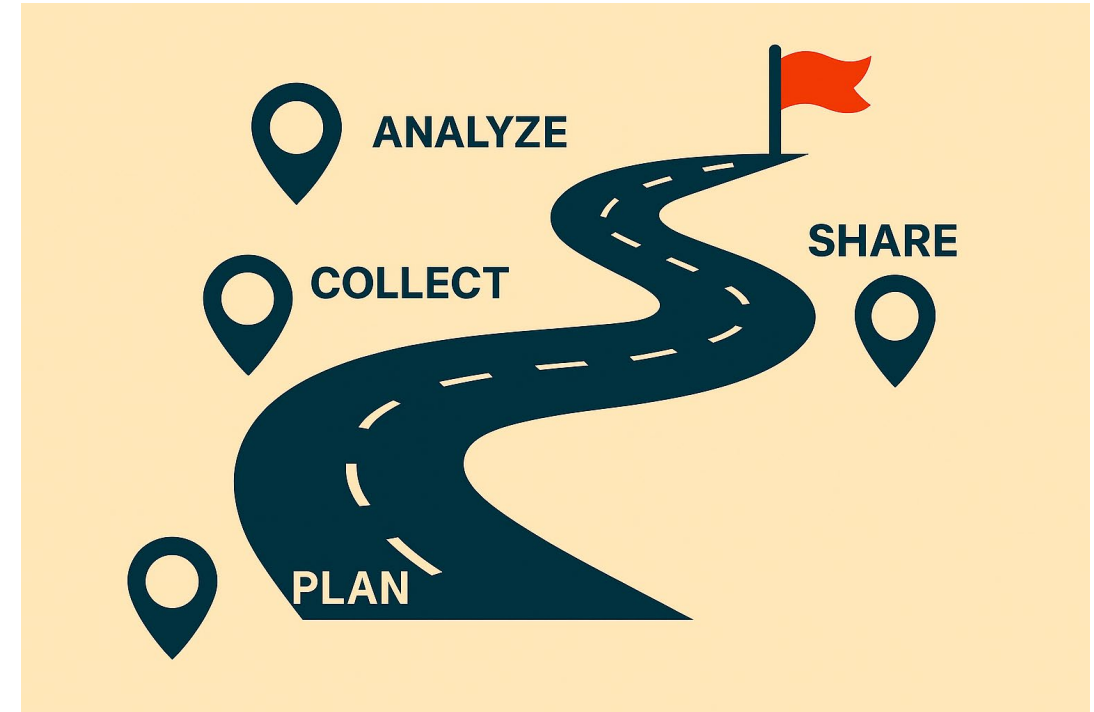
- A predefined **roadmap** outlining how data will be analysed before results are known.
- Guards against ***p*-hacking** and post hoc rationalisation.
- Promotes **transparency and reproducibility**.
- Keeps **analyses consistent** with research questions and hypotheses.



Integrity starts before the first analysis — it begins with the plan.

Statistical Analysis Plan

- Objectives and hypotheses
- Data sources
- Statistical methods and models
- Handling of missing data and outliers
- Pre-specified subgroup analyses
- Ethical considerations
- Transparency in reporting
- ...



Cregan, V., & Lacey, S. (2024). *Research Integrity @ MTU - Statistical Analysis Planning*.
<https://doi.org/10.17605/OSF.IO/YNGJR>

Question

How many of you have seen a Statistical Analysis Plan before collecting data, versus after?





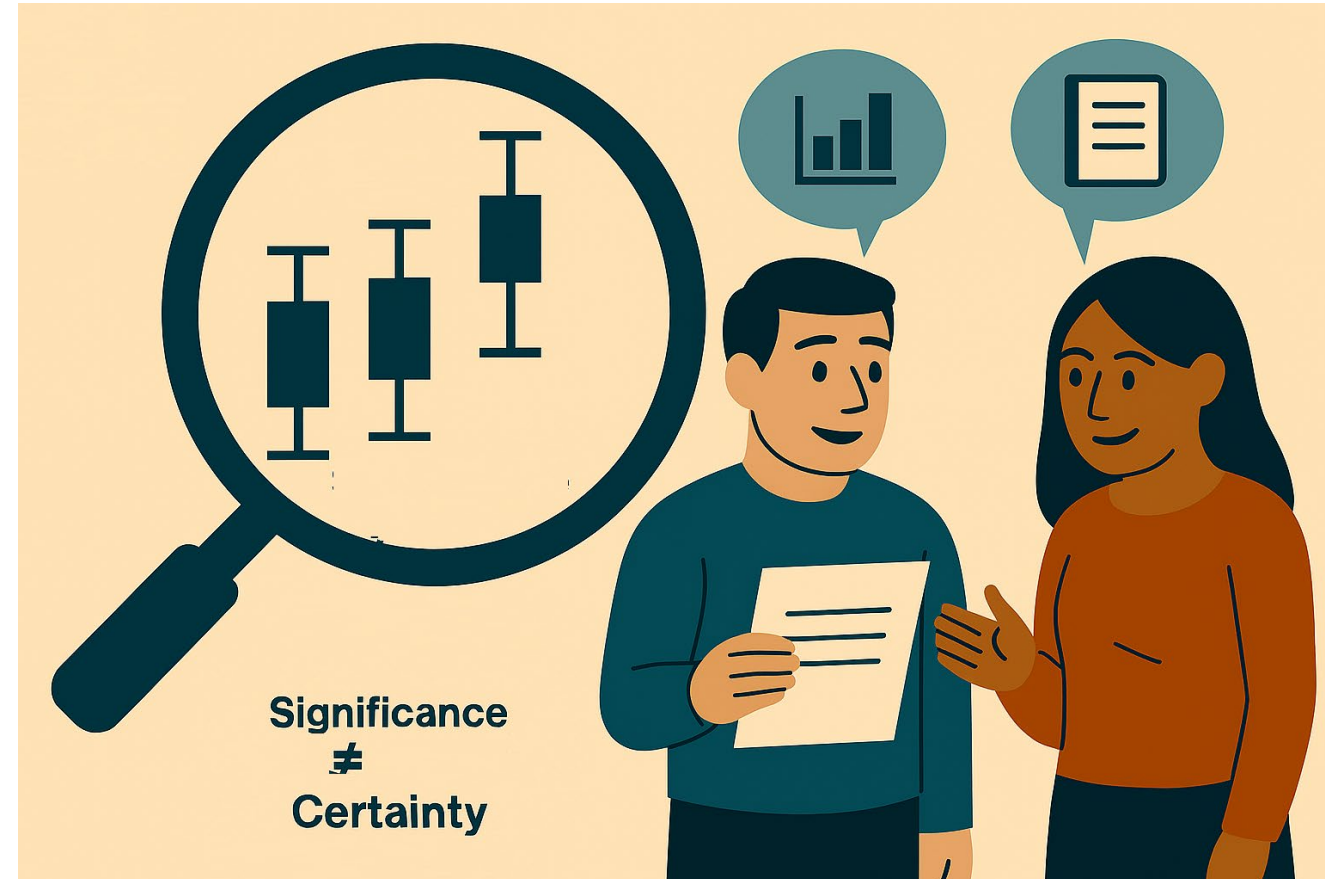
MTU

Ollscoil Teicneolaíochta na Mumhan
Munster Technological University

Sound Statistics

- Reproducibility
- Significance
- Margins of error
- Quantitative and qualitative insights

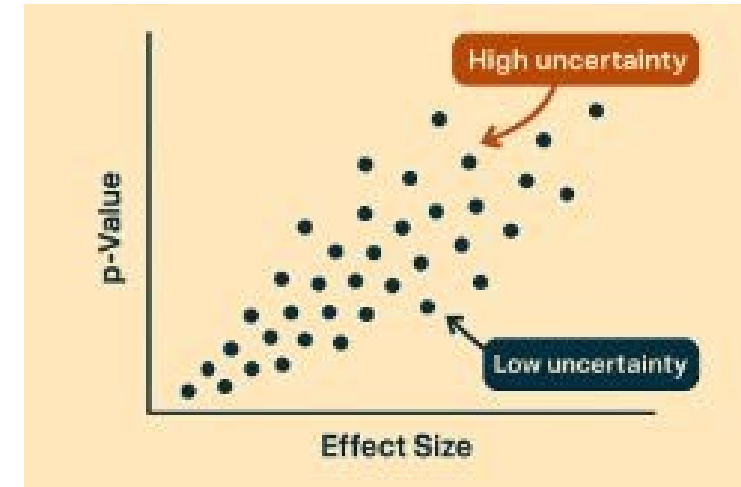
*Reproducibility gives us clarity.
Dialogue gives us meaning.*



Statistical Significance

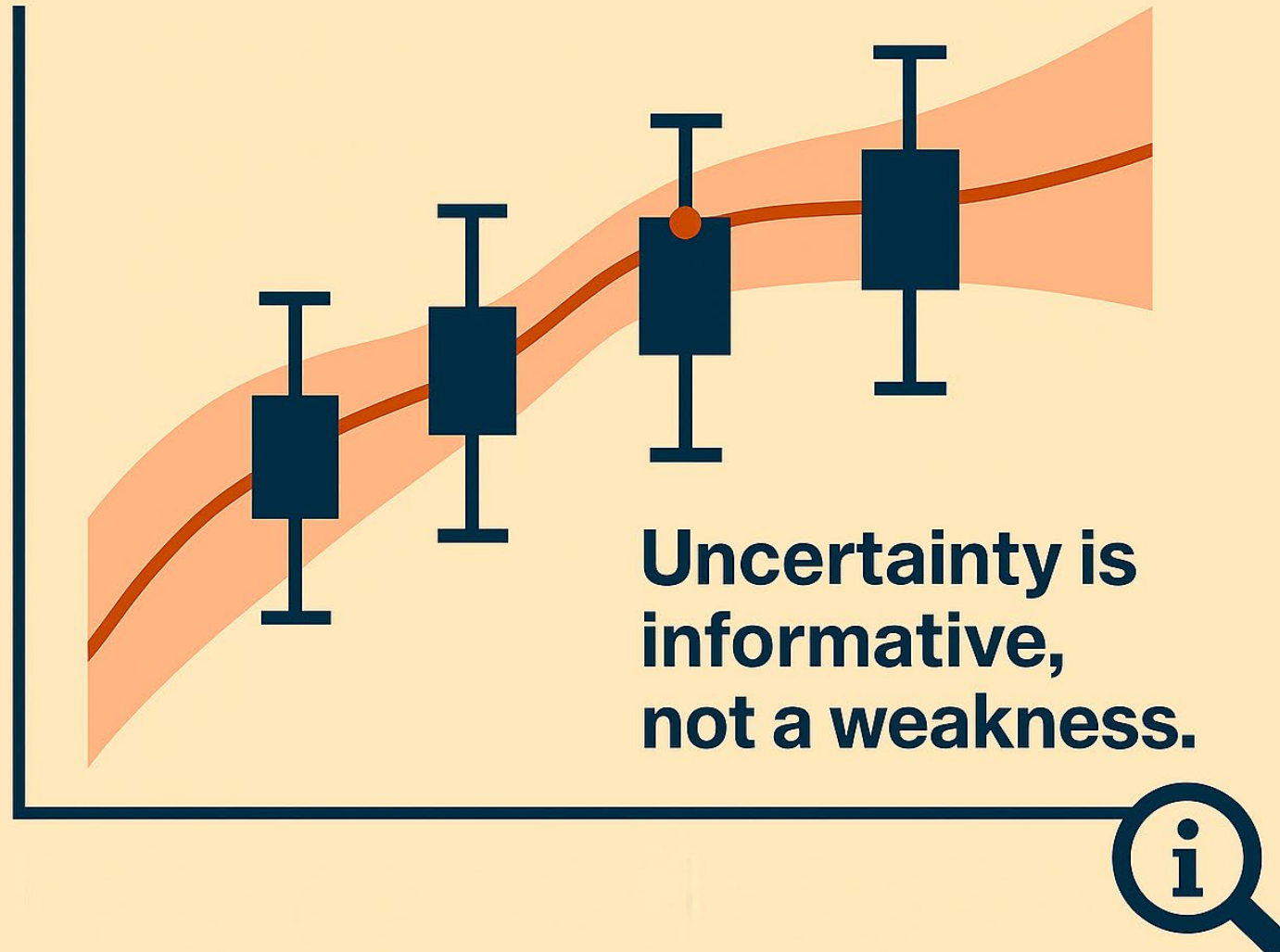
When a statistic is significant:

- It simply means that you are very sure that the statistic is **reliable**,
- It does not allude to the importance of the finding,
- It does not mean the finding has any decision-making utility.



After finding a significant relationship/difference, it is important to evaluate the strength (**effect size**) of the relationship/difference.

Communicating Uncertainty - Quantitative



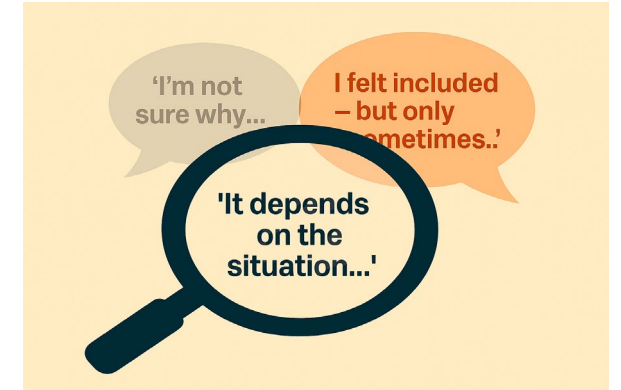
Communicating Uncertainty - Qualitative

Interpretive Depth (vs. Ambiguity):

- Meaning depends on context, voice, and perspective.

Researcher Reflexivity:

- The researcher's interpretation shapes the findings.



Multiple Realities / Perspectives:

- Different participants can experience the same event differently.



Fallacies and Pitfalls

HOME > SCIENCE > VOL. 187, NO. 4175 > SEX BIAS IN GRADUATE ADMISSIONS: DATA FROM BERKELEY

ARTICLE

fXblyw

Sex Bias in Graduate Admissions: Data from Berkeley:

Measuring bias is harder than is usually assumed, and the evidence is sometimes contrary to expectation.

P. J. BICKEL, E. A. HAMMEL, AND J. W. O'CONNELL [Authors Info & Affiliations](#)

	All		Men		Women	
	Applicants	Admitted	Applicants	Admitted	Applicants	Admitted
Total	12,763	41%	8,442	44%	4,321	35%

Wikipedia contributors. (2025). *Simpson's paradox*.
https://en.wikipedia.org/wiki/Simpson%27s_paradox

Bickel, P. J., Hammel, E. A., & O'Connell, J. W. (1975). Sex bias in graduate admissions: Data from Berkeley: Measuring bias is harder than is usually assumed, and the evidence is sometimes contrary to expectation. *Science*, 187(4175), 398-404.
<https://doi.org/10.1126/science.187.4175.398>

Department	All		Men		Women	
	Applicants	Admitted	Applicants	Admitted	Applicants	Admitted
A	933	64%	825	62%	108	82%
B	585	63%	560	63%	25	68%
C	918	35%	325	37%	593	34%
D	792	34%	417	33%	375	35%
E	584	25%	191	28%	393	24%
F	714	6%	373	6%	341	7%
Total	4526	39%	2691	45%	1835	30%

Fallacies and Pitfalls

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Last Updated: Wednesday, 17 January 2007, 02:45 GMT

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Colgate warned over '80%' boast

The maker of Colgate toothpaste has been warned not to repeat its famous advertising claim that "more than 80% of dentists recommend Colgate".

The Advertising Standards Authority concluded the claim on Colgate posters was "misleading" after investigating the phone survey behind the boast.

It found the dentists surveyed were allowed to name more than one brand.



Colgate's claim on posters was "misleading"

BBC News. (2007). Colgate warned over “80% of dentists recommend” claim. BBC. http://news.bbc.co.uk/1/hi/uk/6269521.stm?ref=geckoboard.com&_ga=2.259252809.278576636.1759947768-1132215523.1759947768

Lacey, S. (2025). Research Questionnaire Design. Zenodo. <https://doi.org/10.5281/zenodo.17162172>

Fallacies and Pitfalls



Trump, D.J. [@realdonaldtrump]. (2024). President Trump crushes Biden in Pennsylvania [Instagram post]. Instagram. <https://www.instagram.com/p/C6ZbLk7OYWH/>

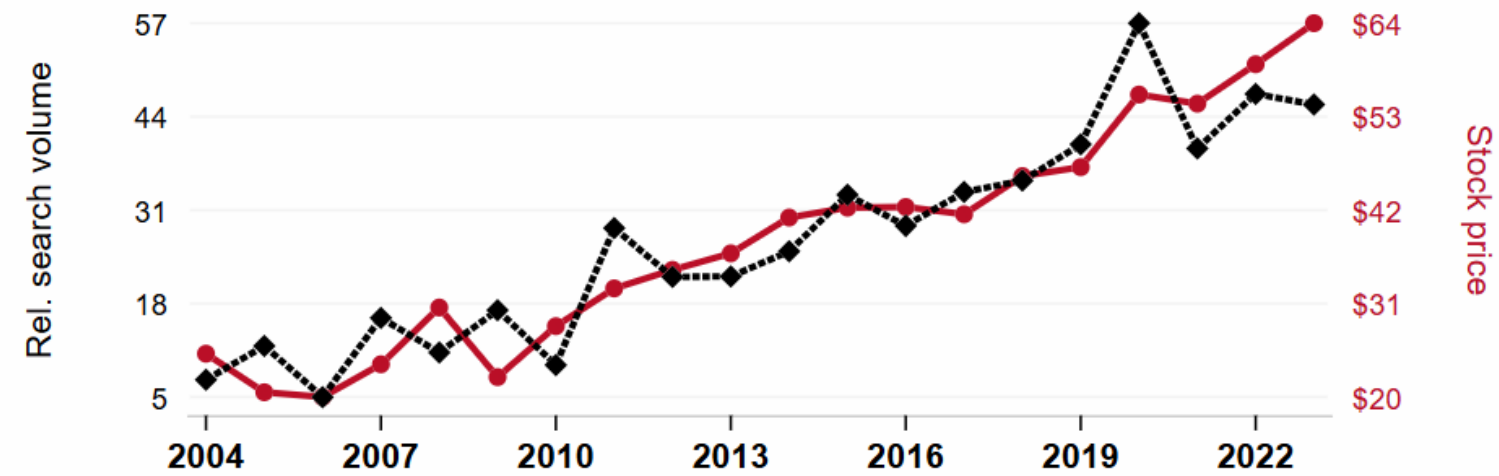
Fallacies and Pitfalls



Gogulski. M. (2007). Image of sign at 4923 Primero St, New Cuyama, CA 93254. https://en.wikipedia.org/wiki/New_Cuyama,_California#/media/File:US-CA,_New_cuyama.jpg

Fallacies and Pitfalls

Google searches for 'who is jk rowling' correlates with The Coca-Cola Company's stock price (KO)

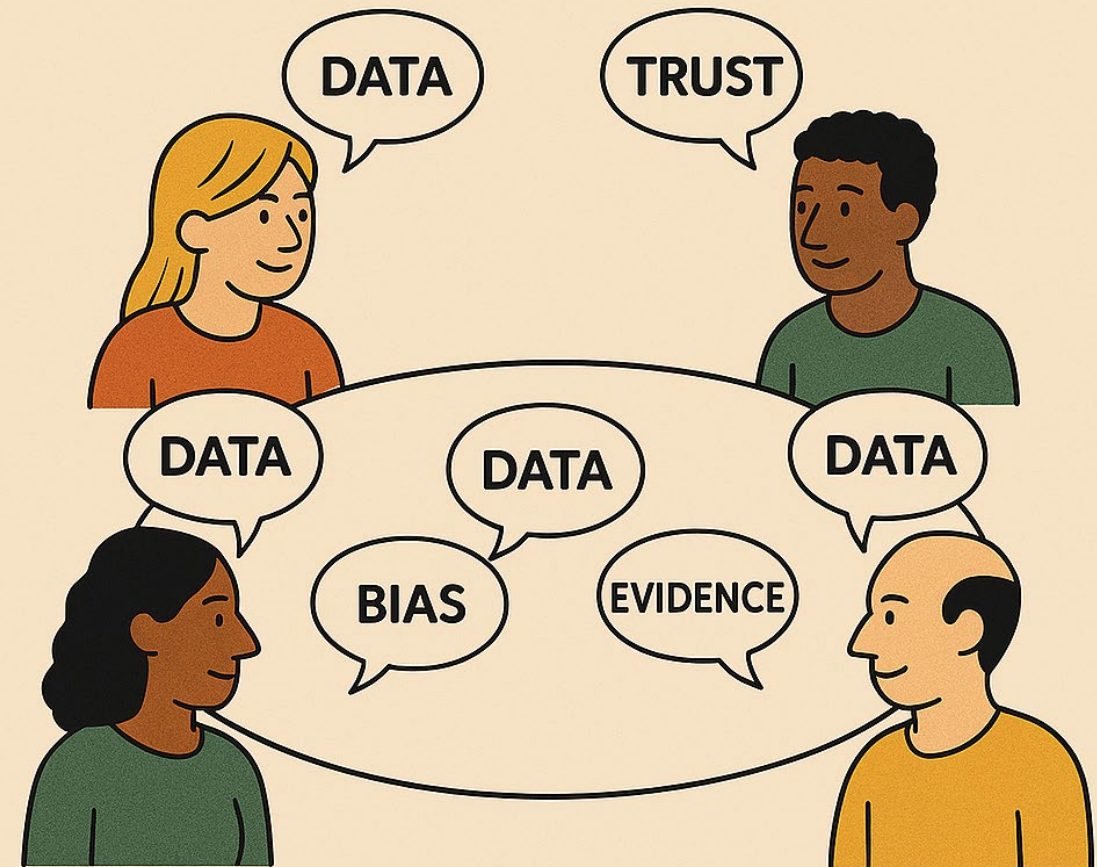


- ◆ Relative volume of Google searches for 'who is jk rowling' (Worldwide, without quotes) · Source: Google Trends
- Opening price of The Coca-Cola Company (KO) on the first trading day of the year · Source: LSEG Analytics (Refinitiv)

2004-2023, $r=0.926$, $r^2=0.857$, $p<0.01$ · tylervigen.com/spurious/correlation/1104

Vigen. T. (2023). Spurious Correlations.
<https://tylervigen.com/spurious-correlations>

- Listen before responding
- Critique methods, not people
- Include diverse perspectives



Bridging Data and Dialogue

WHAT DATA SHOWS

- Facts and figures
- Statistical trends
- Quantitative results
- Objective metrics

WHAT DISCUSSION REVEALS

- Nuances and context
- Different viewpoints
- Subjective insights
- Interpretation and meaning

- Translate complexity for different audiences
- Storytelling responsibly
- Co-creating meaning

Debate and Dialogue

Instructions for:

Trainee

Trainer

Related Initiative

VIRT2UE

🚩 Goal

This exercise helps participants to identify the features of, and differences between, debate and dialogue. Participants become aware of the strengths of dialogue as a tool for reflection processes.

<https://embassy.science/wiki/Instruction:Ac206152-effd-475b-b8cd-7e5861cb65aa>

Statistical Dilemma 02

You submit a paper on communicating uncertainty. One reviewer writes: “The authors misunderstand the concept of confidence intervals — their interpretation is flawed.” The tone is harsh but the critique might be valid. Your co-author says, “Let’s prove them wrong — point by point.” You must decide how to respond.

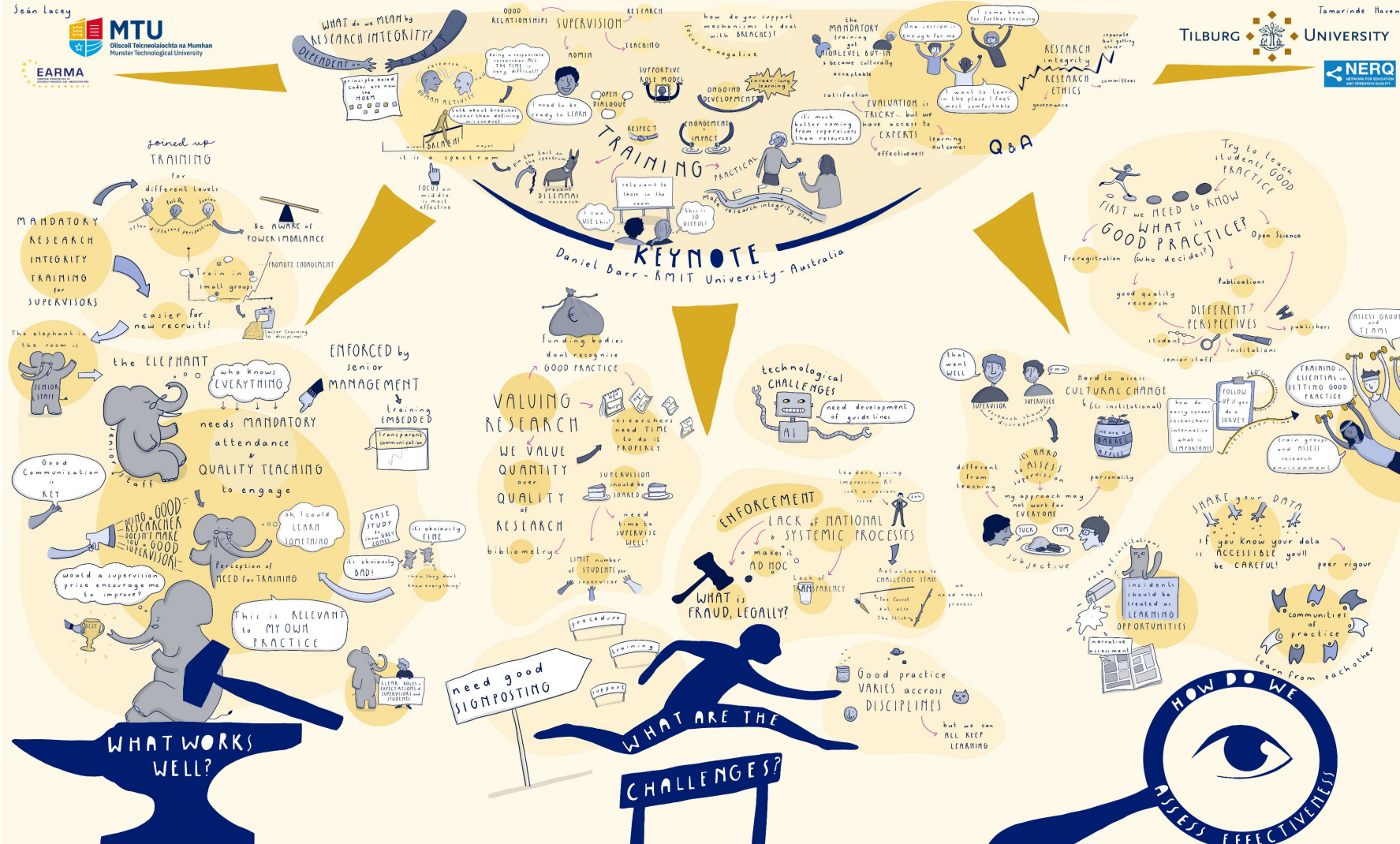
What do you do?

- A. Write a detailed rebuttal to show the reviewer’s mistake.
- B. Make small edits and avoid confrontation.
- C. Acknowledge the concern, clarify your wording, and thank the reviewer.
- D. Ask the editor for advice on balancing civility and rigor.

Leadership



GOOD PRACTICE for TRAINING SUPERVISORS and LEADERSHIP



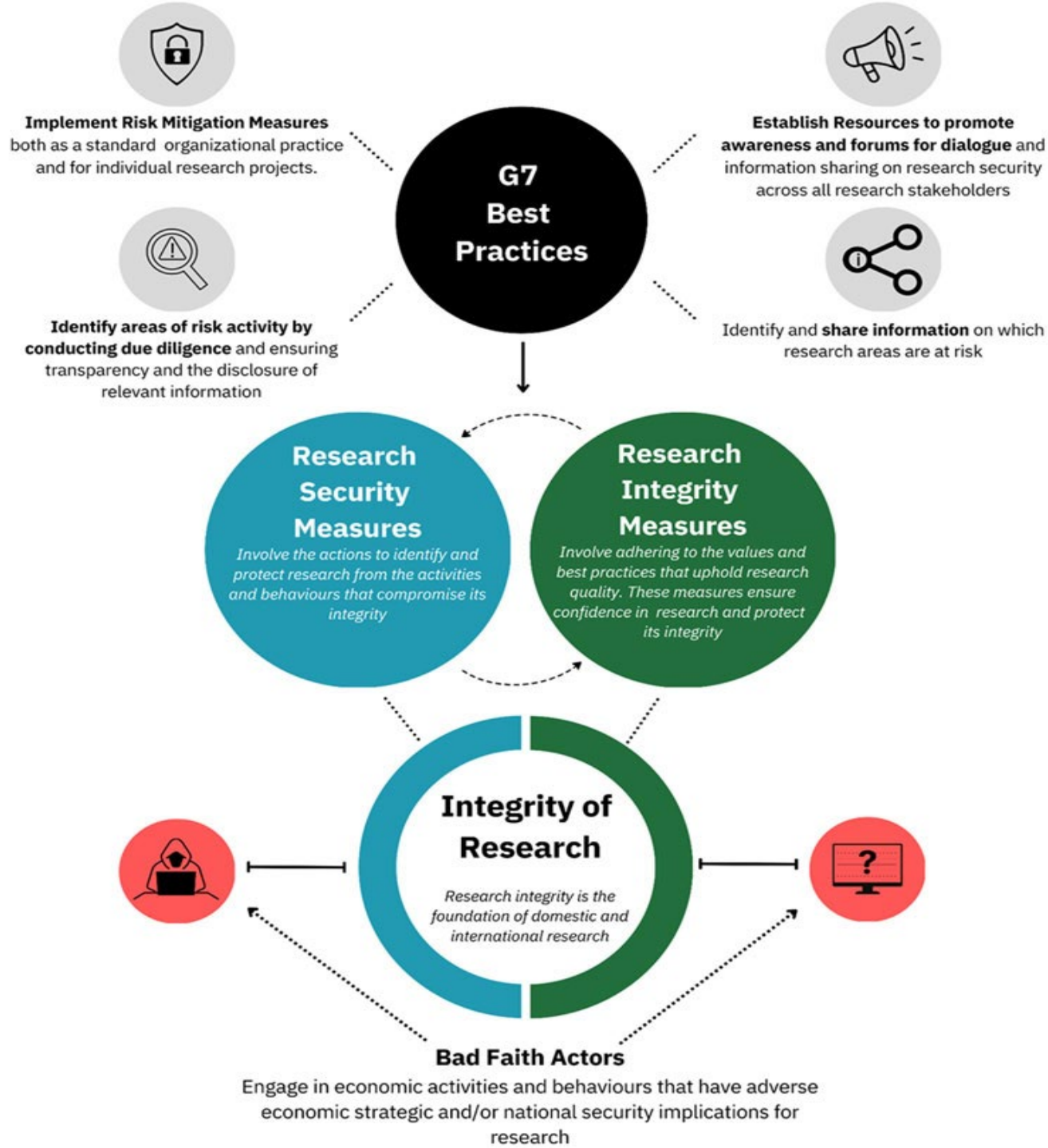
Lacey S., Haven T., Santos R., Farrelly T., Murray M. and Kavouras P. (2025). 'A roadmap to good practice for training supervisors and leadership: a European perspective.' *Front. Res. Metr. Anal.* <https://doi.org/10.3389/frma.2025.1531467>

informed by European research policy makers, supervisors and senior research leaders

New Challenges – *Research Security*

Research security is about preventing the undesirable transfer of sensitive knowledge, technology and research data; ethical or integrity violations where knowledge is used to suppress or undermine our values and fundamental rights; and malign influences that infringe academic freedom and research integrity.

New Challenges – Research Security



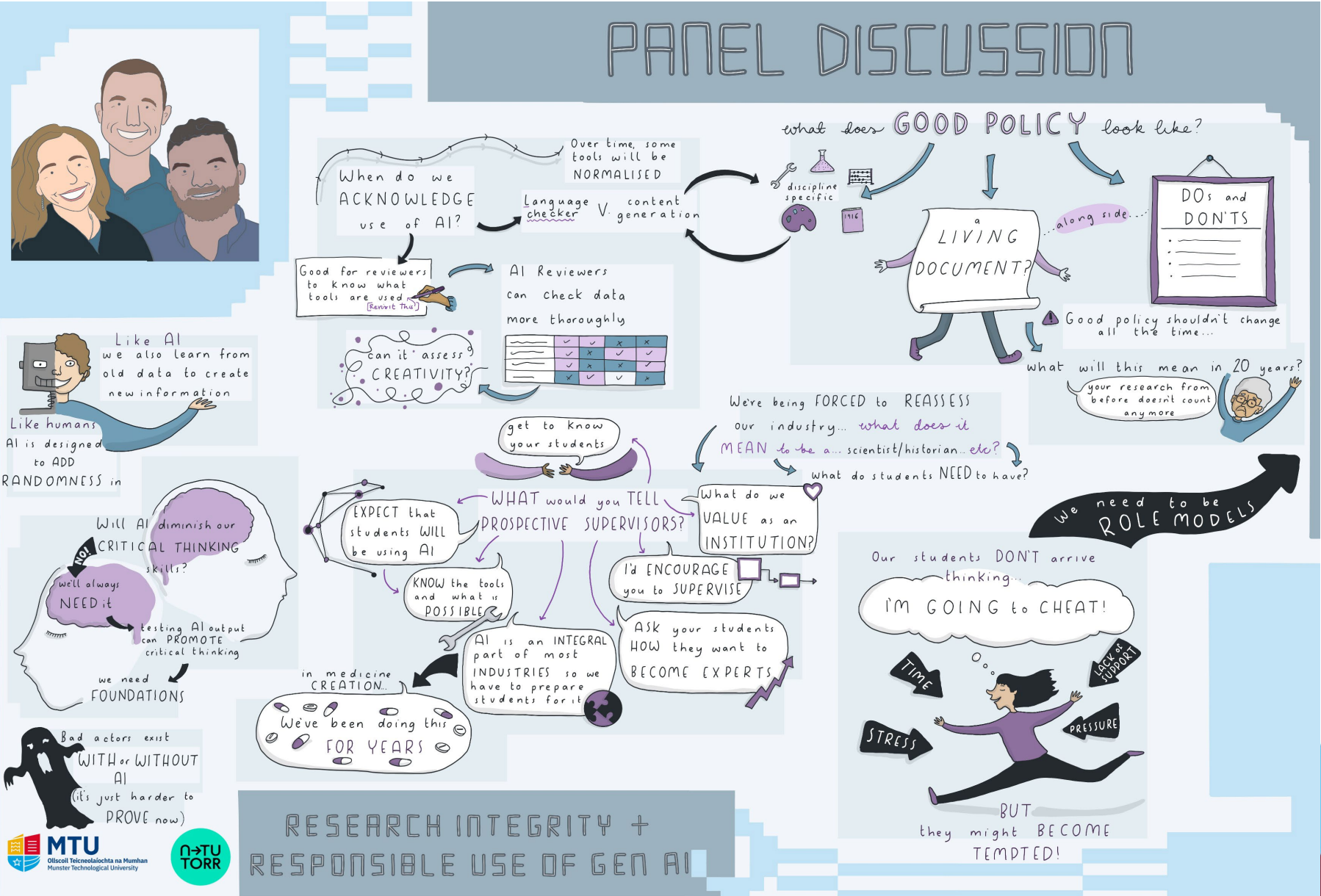
Lacey, S., Farrelly, T., Doherty, T., McMurphy, S., de Róiste, Á., (2025). 'From principles to protection: Leadership in uniting integrity and ethics for research security.' *Societal Impacts*, Volume 6. <https://doi.org/10.1016/j.socimp.2025.100129>

New Challenges – *Research Security*

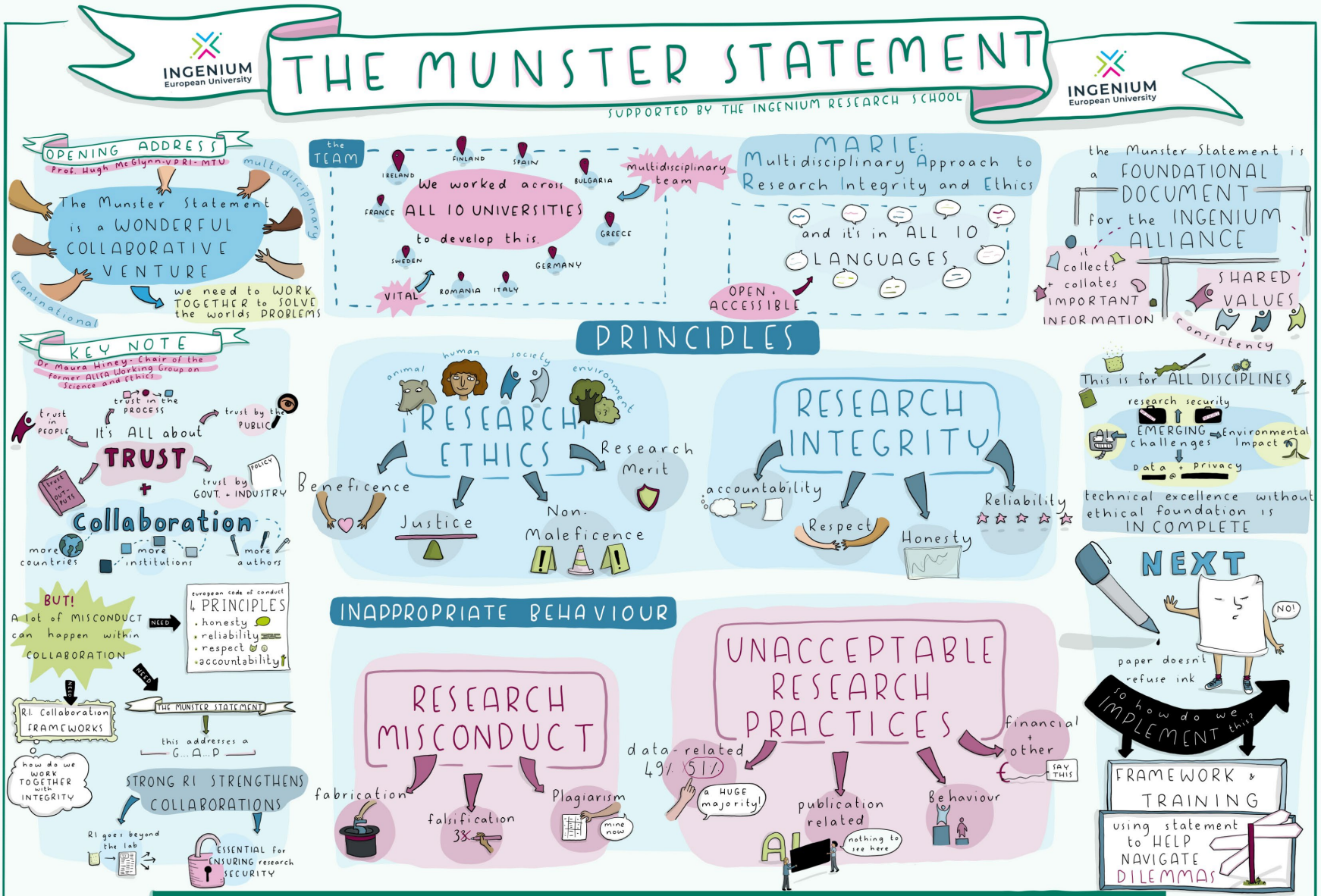
- Promote and encourage international cooperation in research and innovation that is both **open and secure**,
- Focus on **risk management** not risk avoidance,
- Measures taken must be **proportionate** to the level of risk involved,
- **Shared responsibility** with self-governance,
- No **discrimination and stigmatisation**,
- Country **neutral** approach,
- Respect for **academic freedom** and **institutional autonomy**,
- ...

New challenges - GenAI

Foltýnek, T., Wright, A., Baker, N., Farrelly, T., & Lacey, S. (2024). 'Research Integrity & Responsible Use of GenAI.' Zenodo. <https://doi.org/10.5281/zenodo.14289824>



Transparency in collaboration



Lacey, S., Farrelly, T., Petousi, V., POPESCU, A., Mahayni, Z., De Roiste, A., ... MacGregor, O. (2025). The Munster Statement on the Principles of Research Ethics and Research Integrity [PREPRINT]. https://doi.org/10.31219/osf.io/wg6ky_v2

Transparency in collaboration



Transparency in collaboration



Изявлението от
Мюнстер
относно принципите на
научноизследователска
та етика и почтеността
на научните
изследвания



La Déclaration de
Münster
sur les principes
d'éthique et d'intégrité
de la recherche



La declaración de
Munster
sobre los Principios de
Ética de la Investigación
e Integridad en la
Investigación



Munster Statement
zu den Grundsätzen der
Forschungsethik und
Forschungsintegrität



Munsterin julkilausuma
tutkimusetiikan ja hyvän
tieteellisen käytännön
periaatteista



The Munster Statement
om principerna för
forskningsetik och
forskningsintegritet



Η Δήλωση Munster
για τις Αρχές Δεοντολογίας
της Έρευνας και
Ακεραιότητας της Έρευνας



Declarația Munster
cu referire la principiile
eticii cercetării și
integrității cercetării



Dichiarazione di Munster
sui principi etici e sull'
integrità della ricerca



The Munster Statement
on the Principles of
Research Ethics and
Research Integrity

Statistical Dilemma 03

As a PhD Candidate, you were involved in supervising a master student, who finished her thesis two years ago. At the time her results did not seem relevant to your work, but now they turn out to be. You want to use them in the last chapter of your dissertation, giving credit for it to the master student. However, you are unsure about how the data were collected and hence doubt their reliability. Also, you do not have the student's contact details anymore and you are not sure how to contact her. She did not have ambitions to pursue an academic career and your supervisor tells you that it is common practice to just use the data in such cases.



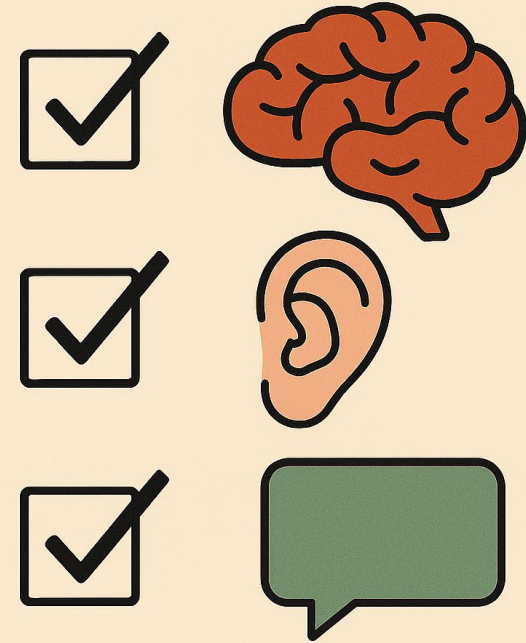
What do you do?

- A. You follow your supervisor's advice and use the data without the student's permission. Because you do not have permission, you also do not mention the student's name in your chapter **2%**
- B. You use the data but acknowledge the work of the student in your chapter. **18%**
- C. You do not use the data. Without the student's permission, it would be unethical to do so. **27%**
- D. You decide to recollect part of the data to verify their reliability before using them for your own analysis. **53%**

Takeaways

Three questions to ask yourself:

1. How do I understand the data?
2. How do I listen to others' interpretations?
3. How do I communicate responsibly?



Thank you!