A Statistician's Holistic Perspective on Privacy-Enhancing Technologies in New Data Partnership Scenarios

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Keynote @ "IPS 882 – The Role of Privacy-Enhancing Technologies in New Data Partnership Scenarios for Official Statistics" – October 9, 2025

WORLD STATISTICS CONGRESS 2025 THE HAGUE

The promise of new data partnerships…

- Official statistics are the foundation of informed societies.
- Statistical offices are moving beyond (traditional data sources like) surveys and administrative data.
- New opportunities lie in combining official data with (new data sources like) private sector data, research data hubs, and (distributed) data spaces.
- These (cross-sector collaborative) partnerships allow the creation of a more timely, complete, and relevant picture of our societies, and help addressing pressing policy needs.
- These partnerships can increase the societal value of official statistics!

‘Just as haute cuisine must incessantly reinvent itself in order to stay at the forefront of gastronomy, official statistics is also confronted with a rapidly changing context and needs.’

Walter J. Radermacher, 2018

Source: Radermacher, W. J. (2018). Official statistics in the era of big data opportunities and threats. *International Journal of Data Science and Analytics*, 6, 225–231.

Trust as the non-negotiable foundation…

- **Official statistics are a trusted public good**, providing evidence for policy and society. Official statistics are built on trust!
- New data partnerships create huge opportunities, but they cannot succeed without safeguarding privacy.
- Public concerns about data breaches, misuse of information, surveillance, and ethical implications are growing. GDPR and similar laws underscore the importance of protecting rights.
- Trust is the non-negotiable foundation — without it, partnerships will fail regardless of technological sophistication.
- **No trust, no data partnerships!**

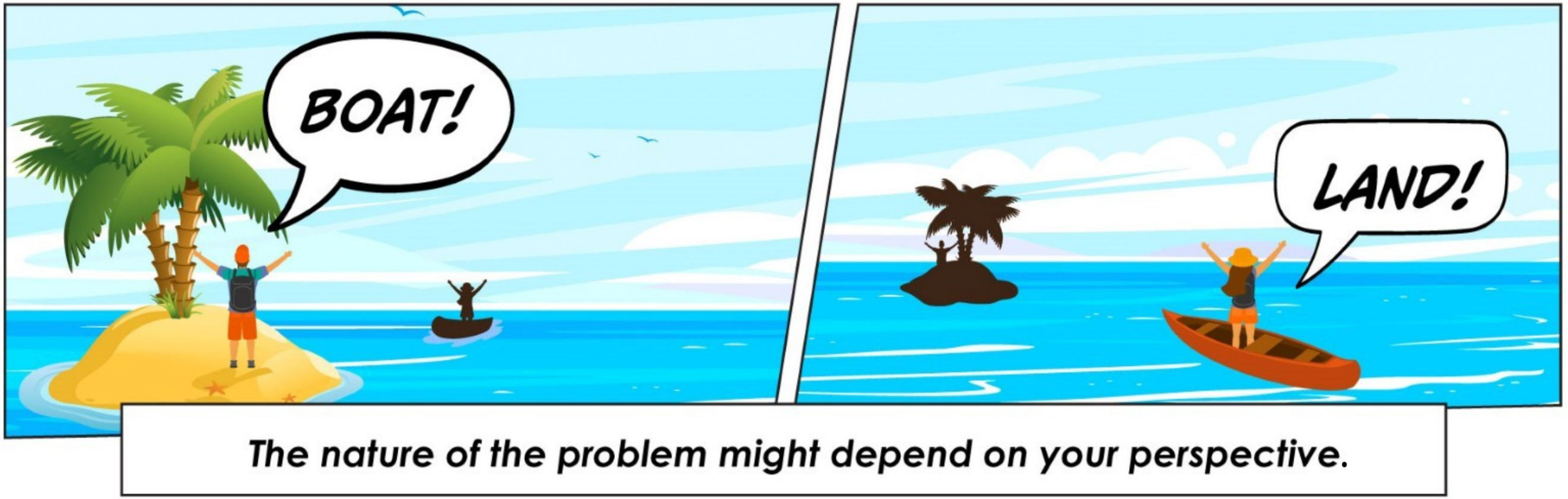

– CAN DATA BE TRUSTED?
– YES, BUT TRUST CAN BE DATED!
memegenerator.net

Rather than aiming to build trust, the task should be to become trustworthy…

'Trust is something that is offered to us, we have to earn it, and we earn it by demonstrating trustworthiness.'

David Spiegelhalter, 2019

… This means demonstrating competence, honesty and reliability, and providing usable evidence that allows others to check trustworthiness.



humber.ca/innovativelearning/wp-content/uploads/systems-thinking/03/sec03-02.html

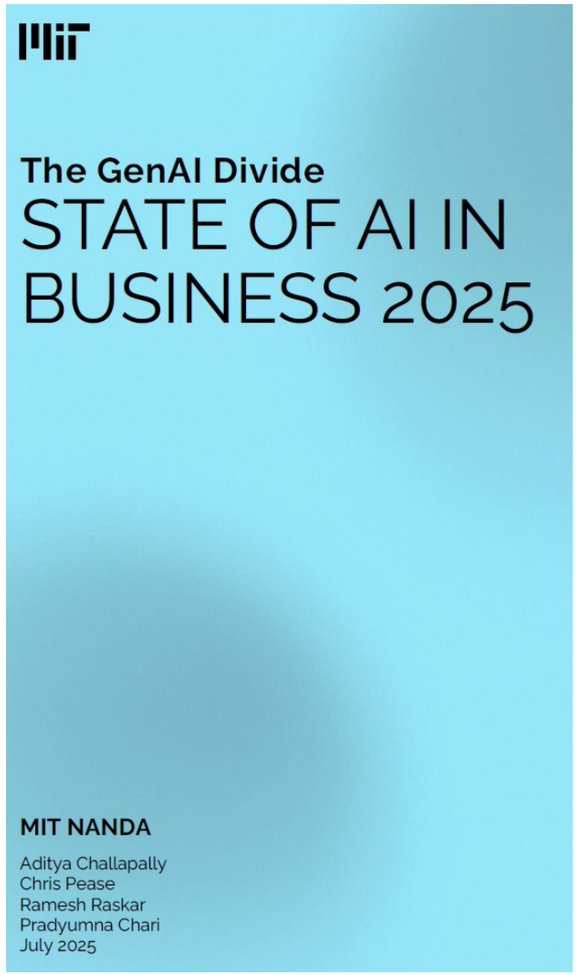
Holistic thinking beyond technology…

- "Privacy-Enhancing Technologies" (PETs) offer solutions that allow analysis while preserving privacy.
  - Examples include secure multi-party computation, homomorphic encryption, differential privacy, synthetic data, federated learning, and trusted execution environments.
- PETs are promising but not silver bullets – **context matters**!
- PETs alone will not solve privacy challenges – a holistic perspective is required!
- PETs require **thinking beyond technology** and a **holistic ecosystem**: rigorous methodology, experimentation, aligned policies, organisational capacity, collaboration management, governance, user engagement, transparency, ethics and culture.


Organizational culture eats strategy
for breakfast, lunch and dinner
Culture
Strategy


MIND THE CULTURE GAP

Learning from high (generative) AI failure rates…



- *Despite $30–40 billion in investment into generative AI (GenAI), 95% of organisations are getting zero return.*
- *"GenAI Divide": only 5% of custom enterprise AI systems reach production, while majority remain stuck and fail to deliver measurable business value.*

- Technology alone is insufficient!
- Do not chase technology without context!

… and the lessons for PETs…

- High (generative) AI failure rates are often due to poor data quality, unclear goals, poor problem framing, lack of organisational capacity, lack of governance, lack of trust, and cultural resistance.

- The **lessons for PETs**: success depends on organisational, governance, and cultural readiness, not just technology!
- PET projects must start small, experiment (carefully with clear use cases), build capacity, embed governance, and above all, build trust with partners and citizens.

"We believe that many leaders are making the same mistake they made a decade earlier with digital transformation: **encouraging experimentation, which is good, but falling into the trap of letting experimentation run wild**, which is counterproductive. … Leaders embraced a 'let 10,000 flowers bloom' approach, hoping that a few experiments produced unicorn-level returns. … While experimentation is good, without a connection to the true business opportunity … experiments inevitably fall short of hopes and expectations. …"

Nathan Furr and Andrew Shipilov, 2025

HARVARD BUSINESS REVIEW

HBR.org/2025/08/beware-the-ai-experimentation-trap

Purpose-driven approach needed…

Purpose first: The need for a paradigm shift in privacy-preserving data sharing

A purpose-driven approach to privacy-enhancing technologies is needed to reconcile policy goals with technical feasibility

- → Data sharing that supports the secondary use of data while preserving individual privacy is crucial for Europe's future data economy.
- → Privacy-enhancing technologies (PETs) play a key role in addressing this challenge. However, they face a fundamental trade-off between retaining information for analysis (utility) and preventing harmful inferences (privacy) which is often not adequately recognized.
- → Current technology recommendations tend to overestimate the effectiveness of specific privacy technologies while downplaying their weaknesses.
- → A shift towards purpose-driven approaches that emphasize risk-based frameworks and realistic, empirical assessments of technological capabilities, is essential to balance privacy and utility in data sharing.

C4DT.EPFL.ch/publications/

Think quality first…

"Quality is fitness for use."

Joseph M. Juran

W. Edwards Deming's 14 points for management:

ASQ.org/quality-resources/tqm/deming-points

Role of statisticians…

- Statisticians act as “stewards of trust and rigor” in data partnerships.
- They ensure PETs are methodologically sound and fit for purpose (fit for use) not only for statistical analysis (“**the right PETs being right**”).
- They mediate (bridge) between technology, partners, policy, and society, building legitimacy through transparency and engagement.

From experimentation to production…

- PETs must progress from lab to practice!
- **Quality should be built into every phase** of the "**PET lifecycle**" (which in itself is a process that must be managed!): starting from "Ideation" (i.e. "business understanding"), to "Prototyping" (i.e. "designing"), over "Minimum Viable Product" (i.e. "development") to "Production" (i.e. "deployment"). These phases represent a journey from initial concept to a product deployed and used in practice, with each stage building upon the previous one.
- **Each phase raises challenges** of scalability, performance, cost, and integration with existing systems.
- **Governance** and **accountability** are essential to have viable and enduring solutions beyond the experimental phases.

The cultural gap…

- Technology and law may be ready, but organisational and societal culture often lags.
- Data literacy must be strengthened among staff, partners, and citizens!
- Without **cultural readiness**, PETs will remain prototypes, never trusted or widely used!

swiss academies of arts and sciences

Swiss Data Literacy Charter

swiss-academies.ch

Guiding principles

1. Data literacy as an asset that is **accessible to all human beings**.
2. Data literacy as a **lifelong learning process**.
3. Data literacy should be considered from **different perspectives**.
4. Data literacy as **the basis for data-based cognition and decision-making**.
5. Data literacy is is **embedded in data ethics**.

- What should I do with data?
- What am I allowed to do with data?
- What do I want to do specifically with data?
- What can I do with data?

Data Literacy:
Leave No One Behind!


DR
ENRICO

Looking ahead…

- PETs, when embedded properly, can unlock responsible innovation and make official statistics fit for the 21st century.

- If neglected, they risk becoming another hype cycle failure, eroding trust and legitimacy in official statistics.

- The direction we choose will shape the future of official statistics and data partnerships!

Call to action…

- PETs are powerful tools but require holistic thinking (and integration) across methodology, governance, law, and culture.
- **Statisticians must lead the way**, embedding trust, ethics, and rigor in every stage of data partnerships.
- Trust in statistics is not built by data alone, but by the way statisticians safeguard and share data.

Recommendation"), provides a good starting point for a common understanding of TDIs. It refers to data intermediaries as "service providers that facilitate data access and sharing under commercial or non-commercial agreements between data holders, data producers, and/or users. Data holders and trusted third parties can act as data intermediaries." (OECD, 2021[5]) While this definition includes trusted third

To balance these various considerations, NSOs increasingly rely on PETs to address confidentiality and privacy risks. (OECD, 2023[22]; 2025[23]) The use of PETs is indeed recognised by a number of NSOs as a key enabling trend, particularly in Australia, Korea and New Zealand, which explicitly refer to advanced PETs such as homomorphic encryption, differential privacy, and synthetic data to facilitate safe data sharing without compromising individual privacy and confidentiality. These technologies are increasingly used as essential tools for NSOs to support their new TDI functions while minimising privacy and confidentiality risks, particularly as the scope of data sharing expands to include sensitive data from private sector sources.

‘A leader is best when people barely know he exists, when his work is done, his aim fulfilled, they will say: we did it ourselves.’

Lao Tzu

‘The transformation can only be accomplished by man, not by hardware (computers, gadgets, automation, new machinery). A company can not buy its way into quality.’

W. Edwards Deming, 1982

‘It is getting better... A little better all the time.’

The Beatles, 1967

THANK YOU for LISTENING ANY QUESTIONS?

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