The Algorithmic “AI Ecosystem”

Autonomous systems that drive enterprise value

Daniel Antal, CFA
2025.08.26.

What is AI today?

01

Artificial Intelligence Act

Article 3, harmonised with OECD

„a machine-based system that is designed to operate with **varying levels of autonomy** and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, **infers**, from the input it receives, how to generate outputs such as **predictions, content, recommendations, or decisions** that can influence physical or virtual environments”

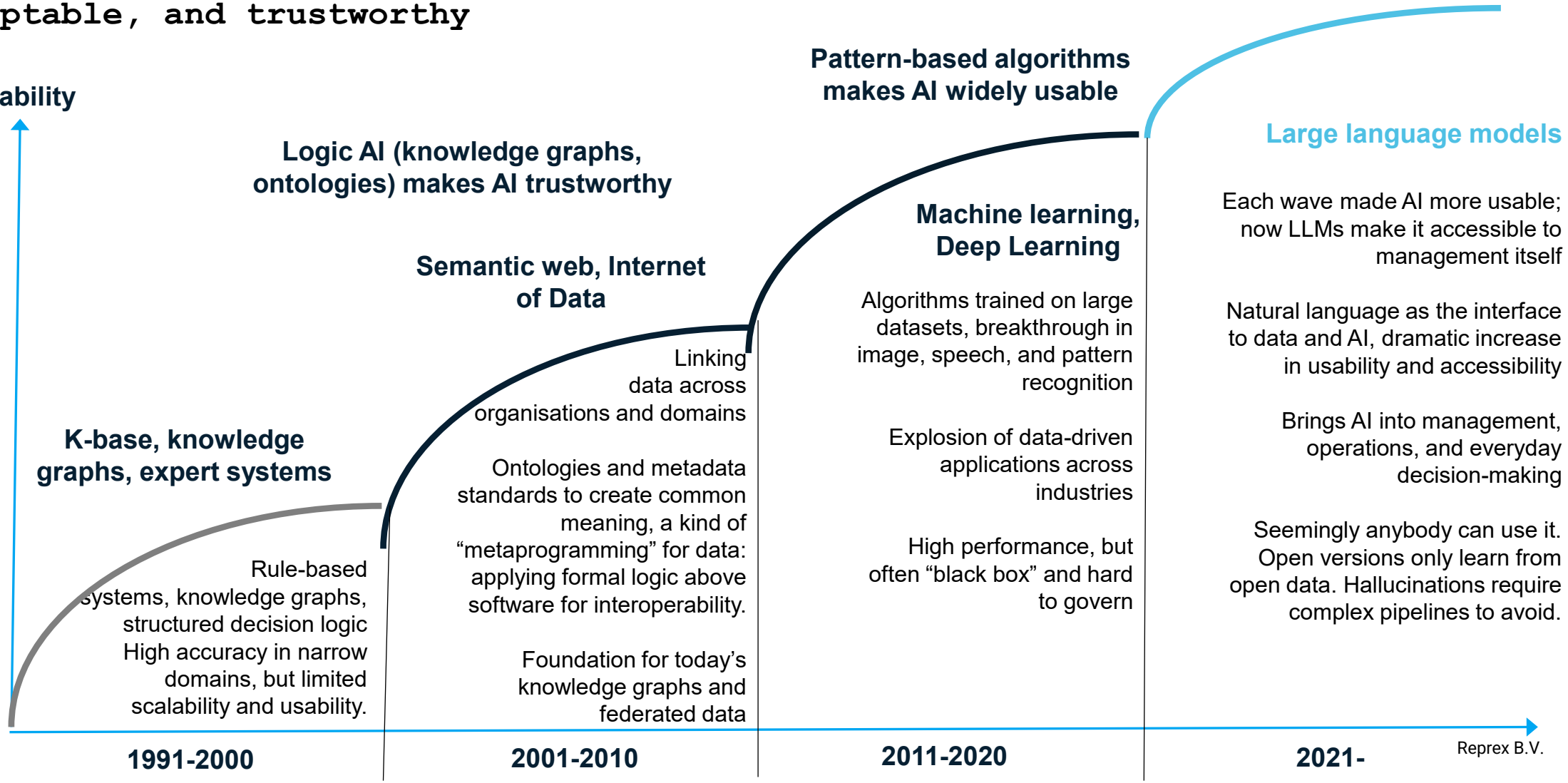
ISO/IEC 22989:2022

ISO/IEC 22989:2022 Artificial intelligence concepts and terminology
ISO/IEC 42001:2023 – AI Management Systems

"an engineered system that generates outputs such as content, forecasts, recommendations or decisions for a given set of human-defined objectives."

AI & Data Evolution

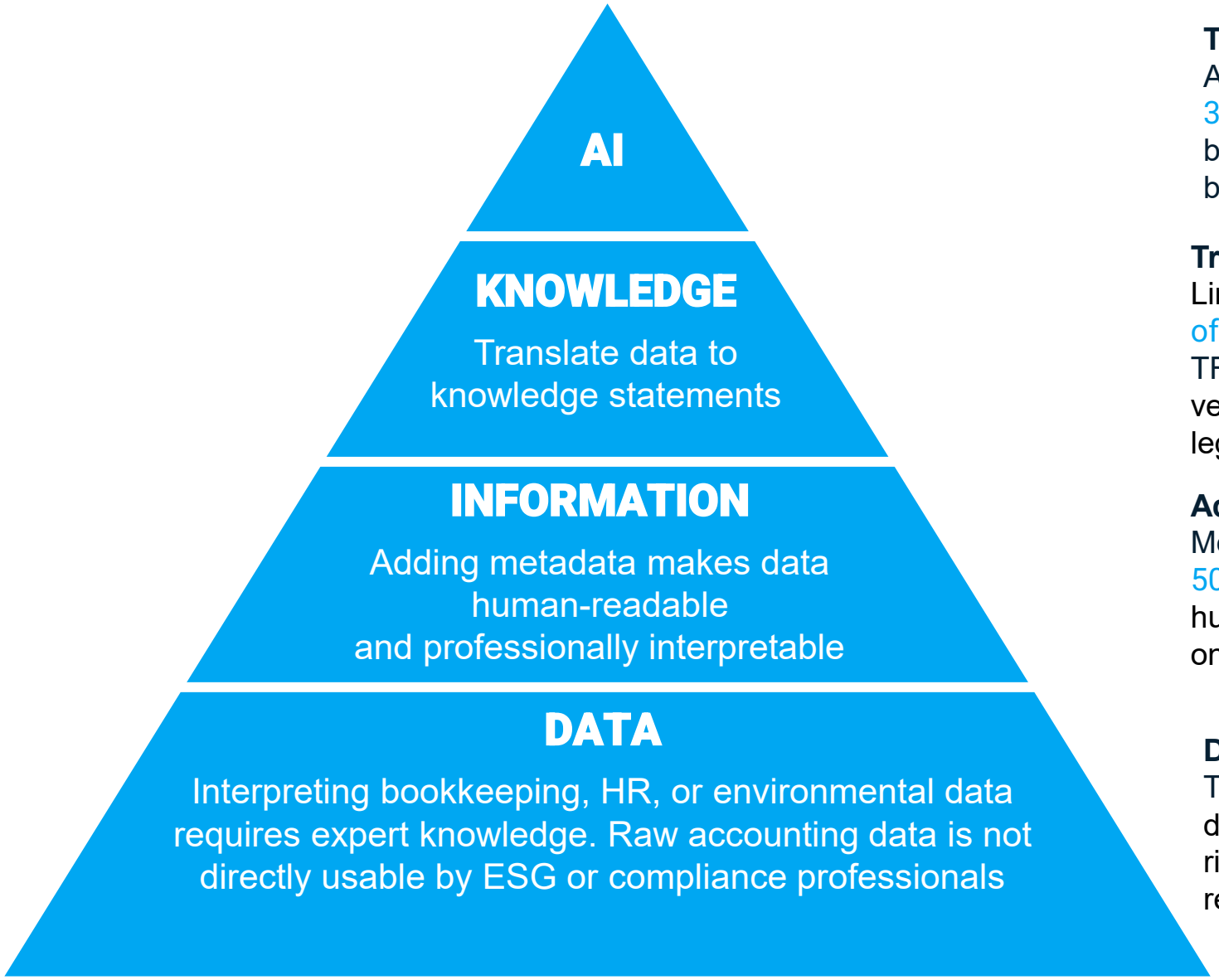
Systemic thinking: Different technologies work together to make AI scalable, adoptable, and trustworthy



What are AI algorithms today?

Different algorithms can help to eliminate error-prone human workflows, or make humans more capable

Algorithm	Analogy	Corporate use
Pattern recognition	Finance forecasting	CFO: “when did the suppliers were that late last time, what is behind this”
Pairing	Buildings, people, addresses	Back office: „why 1.3% of the postal letters come back with address unknown marking.”
Language interaction	Legal due diligence	Compliance: “which local authorities used the same regulatory requirements in the past 30 years”
Inference	Applied logic	Real estate: “which client statements are contradicted by our documents our cadastre and court title documents”
Agent	Autonomous execution	Chat bot, automated table filling and imputation



Trustworthy AI
An AI-inferred statement like
3400 HUF spent on Diesel → results in 128.24 kg of CO_2
becomes a verifiable fact in a well-structured knowledge base.

Transform data to knowledge
Linking to scientific facts (1 litre of Diesel burns to 2.68 kg of CO_2) and expressing it in semantic statements with TRUE/FALSE value turns data into actionable and verifiable knowledge for financial control, sustainability, or legal compliance.

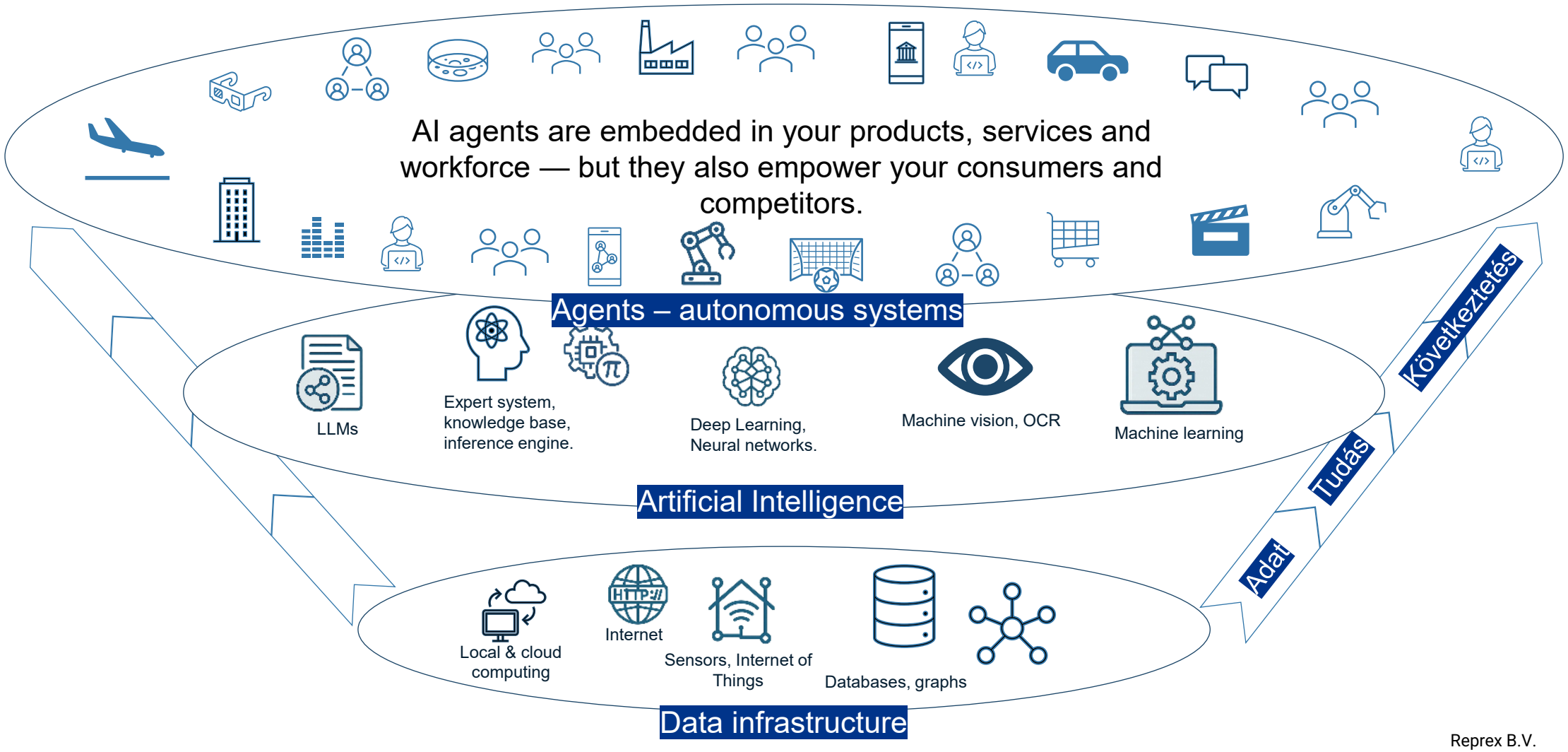
Adding labels and metadata
Metadata like 34000 HUF or Diesel fuel with a unit price of 500HUF/litre makes the data interpretable for both humans and machines when encoded with standard ontologies and labelled in English or Hungarian.

Data needs interpretation
The labels 34000 or Diesel lack meaning without units, definitions, or context. Switching between legal, ESG, rights management, financial controlling or audit contexts requires much metadata.

What Does an Algorithmic “AI Ecosystem” Look Like?

02

The Ecosystem of Artificial Intelligence



NEWSLETTERS · CFO DAILY

MIT report: 95% of generative AI pilots at companies are failing

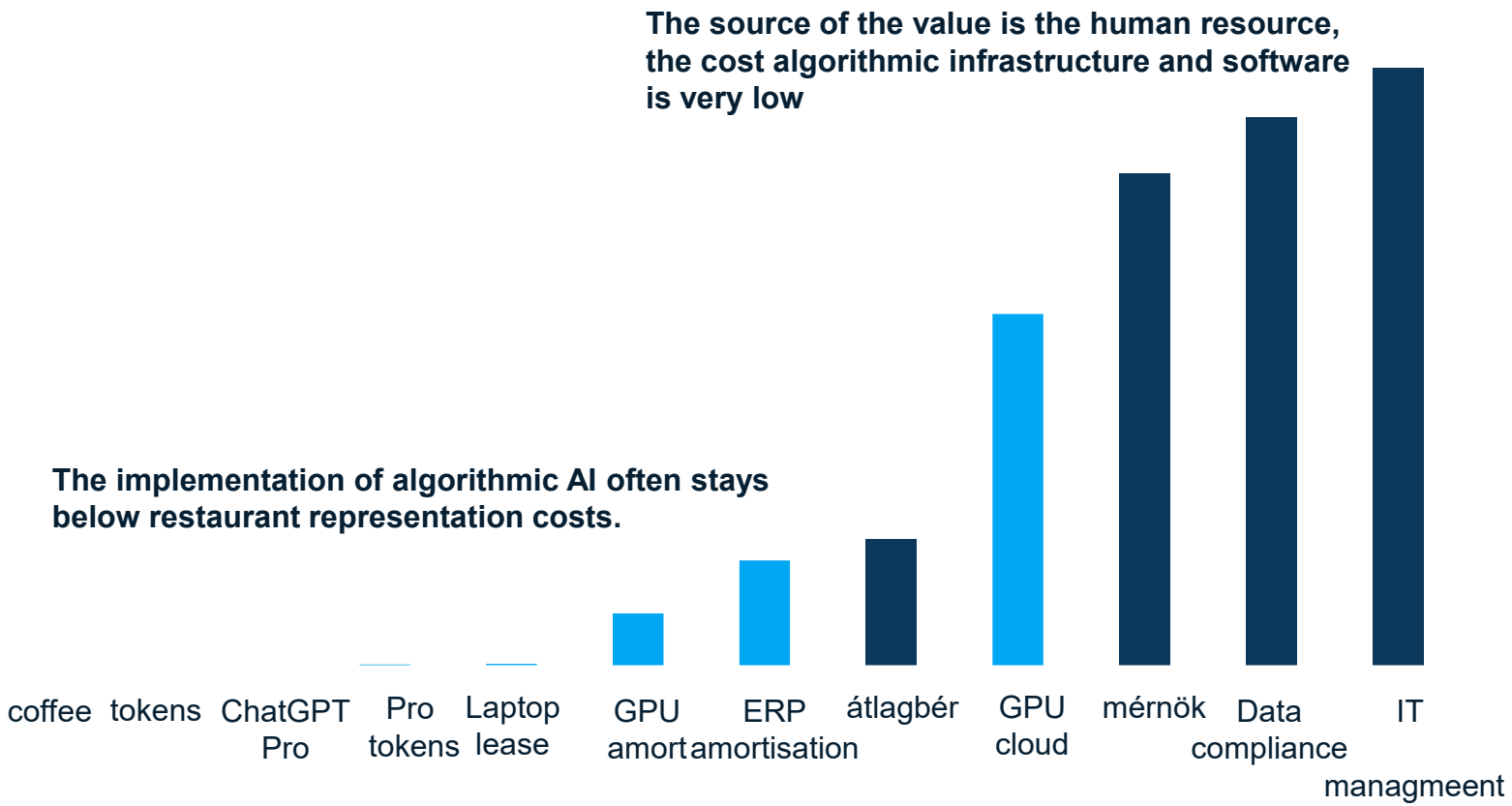
BY SHERYL ESTRADA
SENIOR WRITER AND AUTHOR OF CFO DAILY

August 18, 2025 at 6:54 AM EDT

GETTY IMAGES

What AI Really Costs Compared to People and Systems

AI is almost free — the expensive part is making it trustworthy and usable.



AI is cheap — the real cost lies in people, governance, and integration

- A ChatGPT Pro subscription costs less than a gym membership.
- The computing power to run AI is cheaper than the annual license and amortization of a mid-sized ERP system — and less than the fully loaded cost of an average employee.
- An outsourced AI model or service costs far less per month than the salary of an engineer, compliance officer, or IT manager.

Approximate costs and prices in Hungary and Europe, 2025.

Where Will It Create Proven Corporate Value?

03

AI Create Corporate Value

AI Use	Workflow	Corporate Process
OPEX reduction	Automation of small office task	Back-office optimisation, bookkeeping, data entry
CAPEX optimisation	Better financial modelling	Predictive maintenance, better financial modelling of asset lives, etc.
Working capital management	Supply chain and cash flow optimalisation	JIT, predictive procurement, storage and route optimisation
Human resources	Selection, assessment, enhancing missing skills	AI agents help less skilled or aging workforce remain competitive, better replacement and recruitment
Sales	Personalisation, marketing, self-service	Dynamic pricing, web optimalisation, chatbots, targeting -→ most companies only try AI in this area.
Compliance	Automated reporting	ESG reports, regulatory and stock exchange reports, review of regulatory requirements
Strategic IP	Knowledge capital	ESG knowledge graph, supplier scoring, built environment monitoring

Caution and Trustworthiness: Criticism of Algorithmic Automation

- Algorithms do not work equally well for small companies, women, non-American audiences. If we do not know their in-built data, training biases, or the interest of the creator, then we will not know when they work against us, and not for us.
- In the last decades, every new family of algorithms and technical breakthrough was always followed by scandals of misue or unexpected side-effects

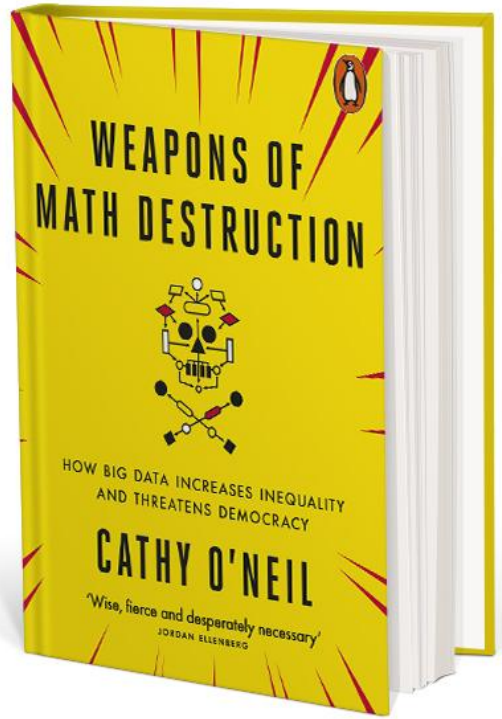
Home | Strong Ideas | Social Science | Technology & Engineering | Data Feminism

Data Feminism

By Catherine D'Ignazio and Lauren F. Klein

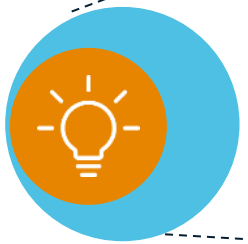
Winner of the Modern Language Association Prize for Collaborative, Bibl

328 pp., 8 x 9 in, 83 color illus., 7 b&w illus.
eBook
ISBN: 9780262358538
Published: February 21, 2020
Publisher: The MIT Press



Competitive Advantage: Only the Top 5% Succeeds And Stay Ahead

67% of successful projects relied on external AI know-how



Enterprise Gen AI

According to MIT NANDA the gen AI projects of large global companies in

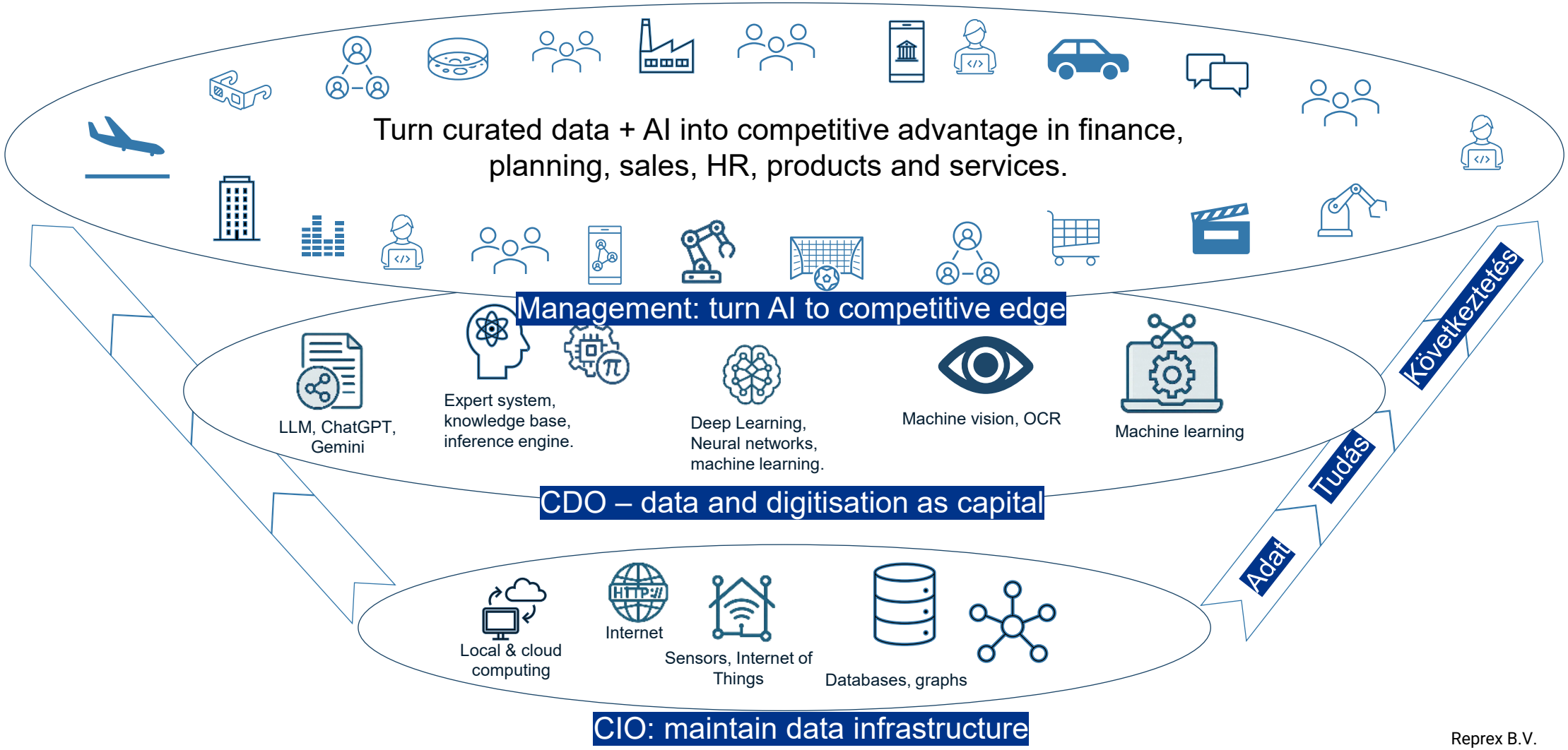
95 %

did not create value.

Autonomous operations inside the enterprise

04

Who Owns the AI Ecosystem?



Skills, Responsibilities, Organisation

05

For Big Data And AI Almost Everybody Is Small

AI talent is very limited

- otologists
- Information scientists
- data & AI engineers
- statisticians

are trained in small numbers.

The use of data sharing spaces and re-use of open-source models alleviates the need to pay premium HR costs for very scarce talent

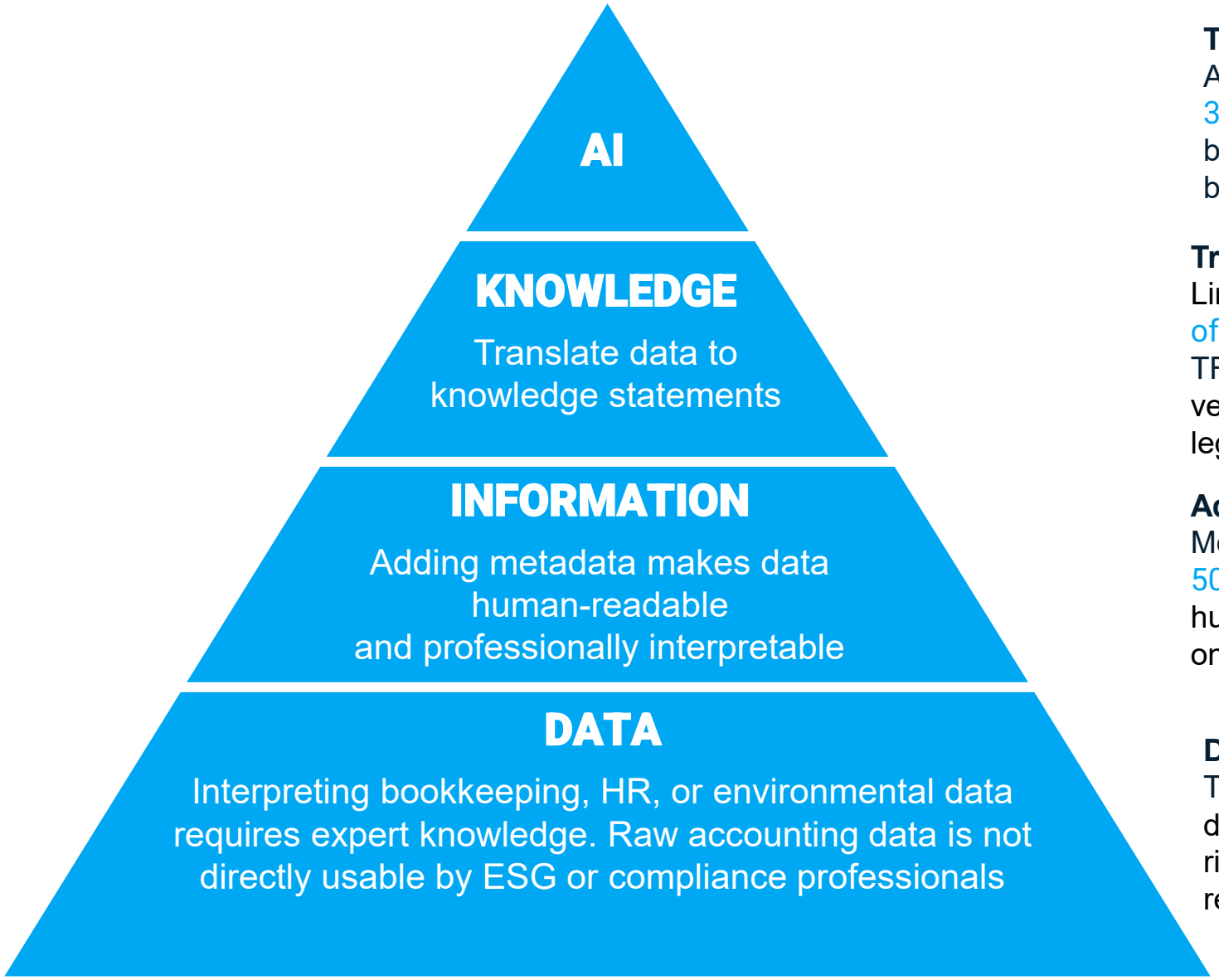
23 million European SME,
96% with less than 10 people

1 million non-profit organisation

2700 universities

…all competing for the same AI & data specialists

Not every organisation can build big data lakes or proprietary algorithms. For most, data sharing and reuse are the only viable strategy.



Trustworthy AI
An AI-inferred statement like
3400 HUF spent on Diesel → results in 128.24 kg of CO_2
becomes a verifiable fact in a well-structured knowledge base.

Transform data to knowledge
Linking to scientific facts (1 litre of Diesel burns to 2.68 kg of CO_2) and expressing it in semantic statements with TRUE/FALSE value turns data into actionable and verifiable knowledge for financial control, sustainability, or legal compliance.

Adding labels and metadata
Metadata like 34000 HUF or Diesel fuel with a unit price of 500HUF/litre makes the data interpretable for both humans and machines when encoded with standard ontologies and labelled in English or Hungarian.

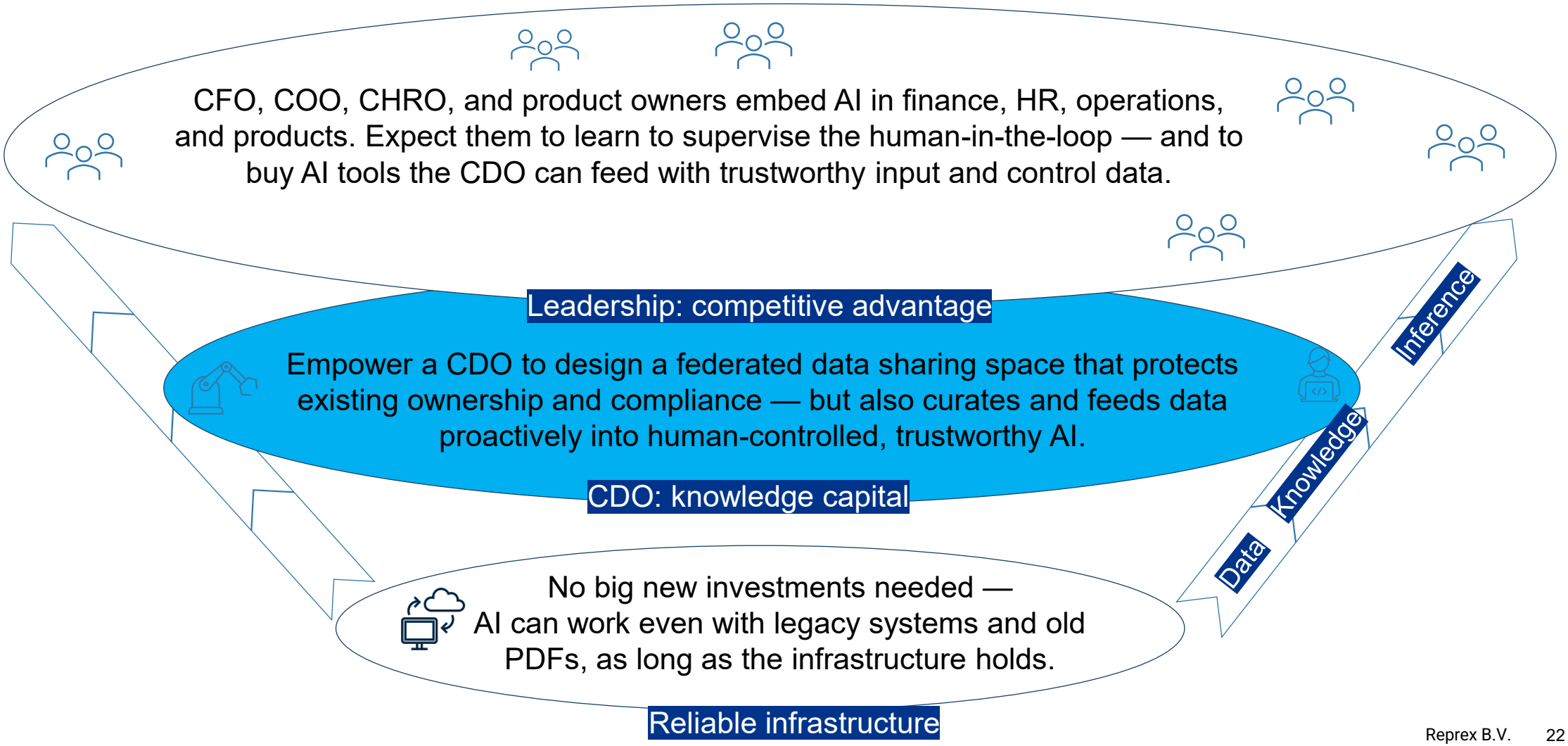
Data needs interpretation
The labels 34000 or Diesel lack meaning without units, definitions, or context. Switching between legal, ESG, rights management, financial controlling or audit contexts requires much metadata.

Future-Proof Solutions

The Ise Grand Shrine has stood for 1,600 years not because the wood never rotted, but because the knowledge of renewal was passed on from generation to generation. The design of regeneration and the embedded know-how were the true asset, not any single plank of wood. A federated data sharing space with curative AI works the same way: it doesn't just store clean data, it preserves how to fix corrupted records, reshape data for new systems, and upgrade databases while staying compatible with legacy software. That makes it future-proof — ready for the next systems — and past-proof, since it still works with the old ones.

Images: .伊勢神宮 Ise Grand Shrine, a wooden building that has been in use for 1,600 years thanks to regeneration plans handed down across hundreds of generations.

Algorithmic AI in the Organisation: Chief Data Officer



Algorithmic AI in the Organisation: IT

1. Future-proof AI with a data sharing space creates value in the business layer by enabling better OPEX, CAPEX, HR, and sales decisions.
2. With a conservative estimate, a system that costs EUR 30,000 to run monthly, with 20% discount rate, will break even if it yields 10% OPEX gain on a cost base of ~EUR 3.6 million.
3. Curative AI in the IT layer creates value by prolonging asset life and reducing replacement needs, avoiding full modernisation cycles.
4. The same system will break even with 1% savings on an annual IT budget of ~EUR 36 million — even if there are no actual gains on OPEX, CAPEX, HR, or sales.

No big new investments needed —
AI can work even with legacy systems and old PDFs, as long as the infrastructure holds

Reliable Infrastructure

Data

Knowledge

Inference

Chief Data Officer

06

Why CDOs Fail? How to Make Them Strategic?

What is the Problem?

1 High attrition rate
- Average tenure 1.7-2.5 years
- High turnover
- Often demoted below CIO

2 Vague mandate
- Compliance vs. transformation
- Only 40% of companies feel the CDO/CDAO role is well understood

Why CDOs Usually Fail?

3 Unrealistic expectations
- Expected to deliver enterprise transformation in <18 months
- Pressure for immediate ROI from data initiatives
- Ambiguous/unrealistic goals make value hard to prove
- Cultural resistance to new ways of working

4 Lack of Authority, Unclear Boundaries
- Unclear reporting lines (often to CIO, not CEO)Governance fragmented across IT and business units
- Many CDOs stuck in compliance rather than delivering business value
- Insufficient resources/budget to drive cross-company change
- In Europe, data governance is confused with a narrow data protection (what not to do with the data.)

5 Skill Misalignment / Capability Gap
- Many CDOs come from IT or compliance backgrounds, not analytics or AI, CDOs perceived as “glorified IT or compliance managers”
- Organizational frustration: lack of advanced data curation, analytics, proactive data governance and algorithmic skills

Solutions

6 Knowledge as Capital, not IT
- Mandate anchored in business value creation
- Report to CEO/COO
- KPIs linked to financial and strategic outcomes
- Quick wins to bring acceptance and clarity to the role in the organization

7 Empowerment and Infrastructure
- Enterprise data sharing space (not siloed data lakes)
- Clear authority over governance and curation
- Adequate resources

8 Acquire Skills
- Hire or upskill for data curation, analytics, and algorithmic literacy
- Surround CDO with data stewards embedded in business functions

CDO as Service?

Outsourcing happens, particularly among medium-sized enterprises

CDO roles are immature and fragile
- Many medium-sized and even large firms lack a CDO.
- Where appointed, success is rare and attrition high.

No urgency to appoint
- Over the next 2–5 years, data governance, knowledge capital, and AI will become central.
- At that point, a strong CDO may be needed — or will emerge naturally.

De-risk with an external partner
- Early failures can be avoided by starting with an external knowledge capital partner to build infrastructure, workflows, curation practices, and culture.

Federated approach fits the group
- With data federation, normalization, and knowledge graphs in place, management understanding matures
- An external partner reporting to CEO/COO avoids clashes with CIOs or BU leaders.

Reprex

07

Data sharing and exchange in the Slovak music data sharing space

We use AI to understand, connect, cross-enrich and correct the outputs of heterogenous and obsolete systems

Printed music

Increase the availability of printed music via webshops and library access

Integrate libraries

Enable search in libraries and archives, locate printed music and records for public lending

Data health checks

Ensure that streaming services can recommend the music and pay out artist

Improve recommendations

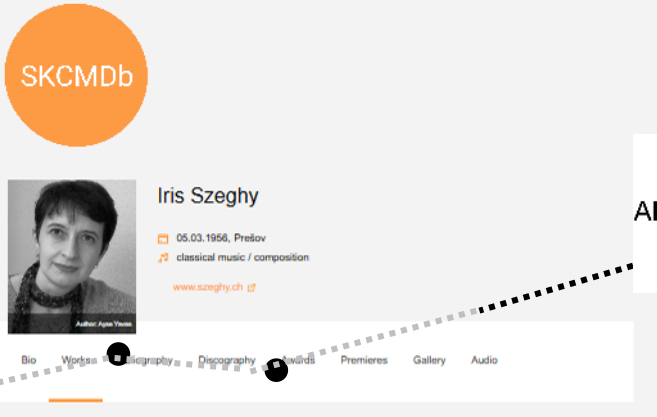
Music info centre sends authoritative repertoire data

Improve statistics

Satellite business register coordination for better surveys of music

Local content regulation

Help radio stations to comply with legal local content quotas.

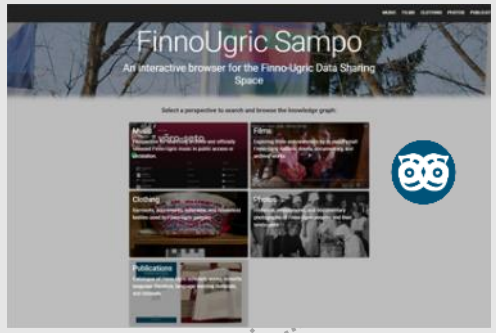


WIKIBASE WIKIDATA

TextileBase finno-ugric SKCMDb

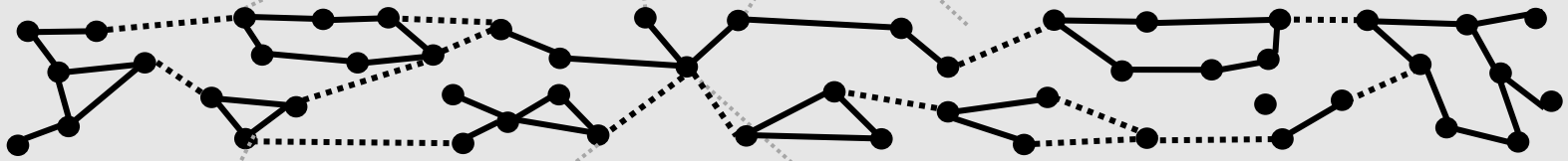
Our systems

We can build from open source or enterprise components systems that cross corporate, private/public boundaries to build an optimal knowledge capital for our users



RDF RDF

Application layer, f.e., Sampo click-and-play semantic browser



WIKIBASE **Conceptual and data model** jena

Our peer-reviewed, scientific software libraries and ontological patterns **standardise the data**

RDF FINNA.FI XLS Geonames SEIDOMAA MUUSEUMID CSV SQL CSV zenodo MÕNISTE TALURAHVAMUUSEUM

data curation from sources

Company Name reprex

Data Sharing Space for Optimal Knowledge Capital Increase

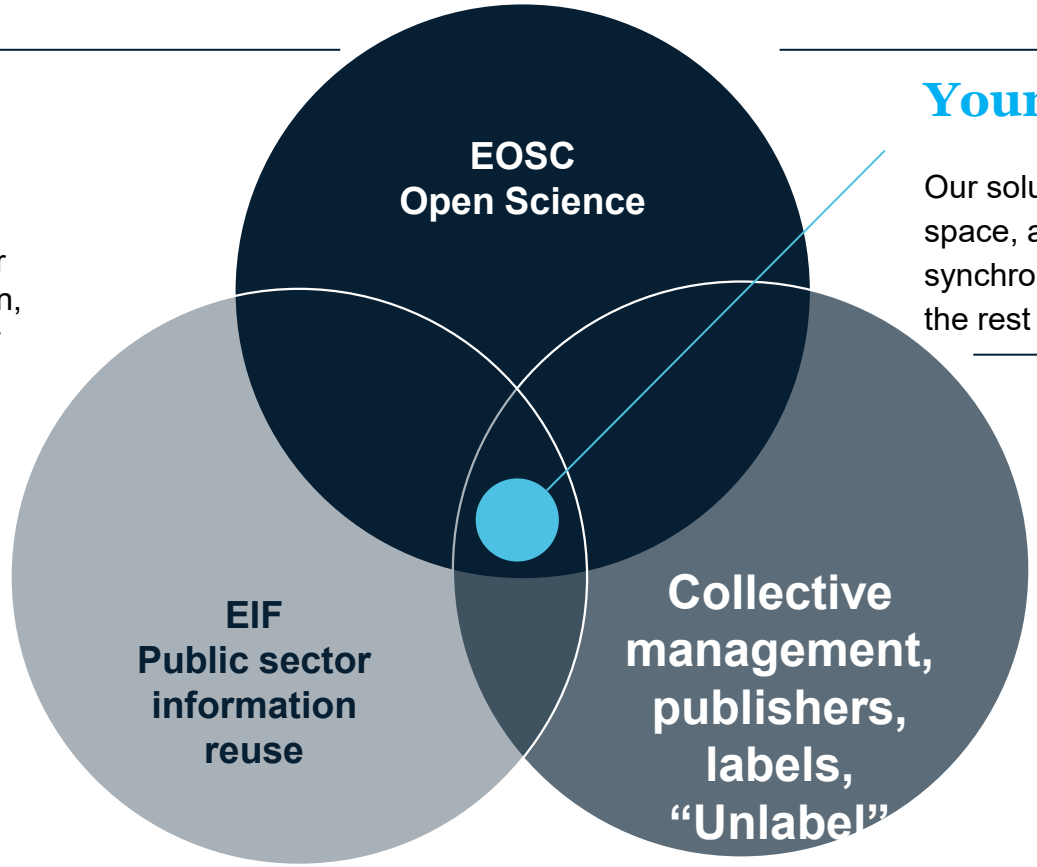
We create data (sharing) spaces that not only follow the models of the European Interoperability Framework and EOSC and extend to interoperability with private partners

Open Science

In most developed countries, a large part of science is publicly funded and the results of science are available for free. Such data may help in innovation, sustainability management, and other areas where the internal knowledge capital of the company is weak.

Public sector information reuse (open data)

The Open Data Directive (2019/1024/EU), the Data Governance Act (2022/868/EU) gives legal access to much data for free or at marginal cost which are not available from private vendors (satellite images, building cadastres, jurisprudence databases.)



Your Data Sharing Space

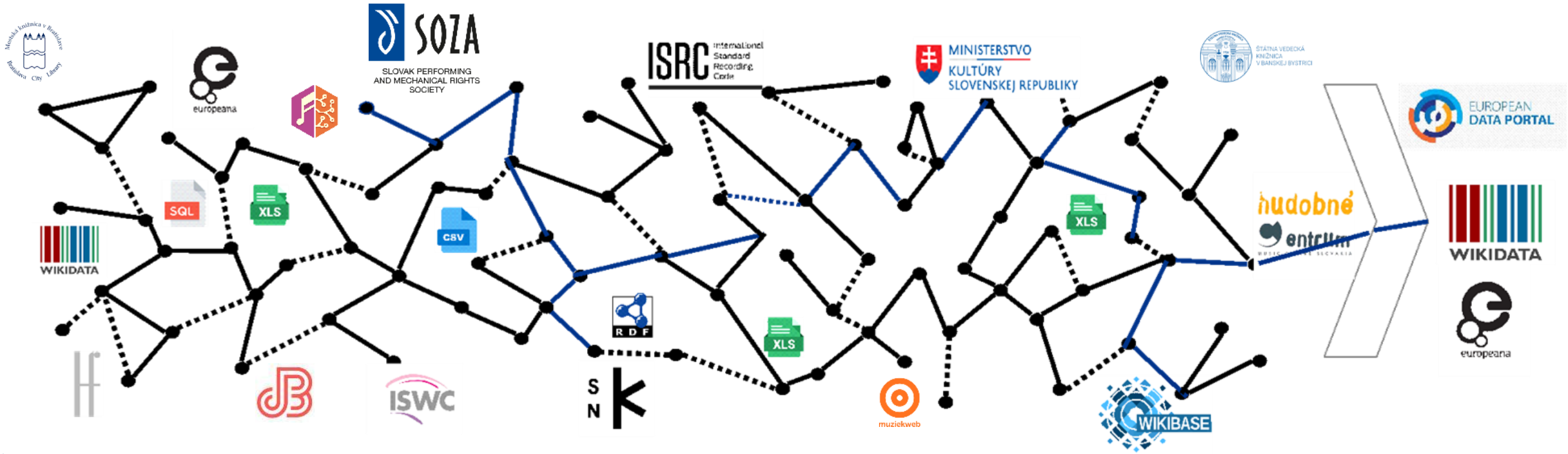
Our solution involves the creation of a data sharing space, an automated data governance tool that synchronizes your group’s data with the data from the rest of the world.

Coordination of privately-held and public sector data

The Data Governance Act and various statistical regulations allowing novel data coordination between privately-held and governmental data. This allows the company to optimally increase its knowledge capital about prospects, clients, suppliers, and the built and physical environment.

Multi-Organisation Exchange Requires Governance of Continuous Data Improvement, Better Standardisation (Our Slovak Music Use Case)

SKCMDb



1. Data enrichment and cross-checking

Reprex consolidates the data Excel, CSV, SQL and other database (data file) formats of SOZA, Slovak Music Centre, Music Fund, and other organisations into a graph format. We assist curators to find and improve errors in their metadata. We ensure that the resulting data is more usable for rights management, heritage management, publishing.

2. Data dissemination

We send the enriched and proprietary (confidential) data to the systems of SOZA, Slovak Music Centre, Music Fund or other participants. We sent the public data to the EU Open Data Portal (statistical data), to EOSC (data of scientific value), collections data (Europeana and ECCH), and biographical and repertoire data to Wikidata and Wikpedia. This way streaming providers can use reliable data about Slovak music.

European Interoperability Framework: Layers of Service Interoperability

Legal interoperability	Rules of the data exchanges and use is harmonised to a level that negotiations and permits can be obtained fast to join the data.
Organisational interoperability	Organisations harmonise their internal workflows and jobs that use data to benefit the most from improving and enriching their own data with other sharing partner's data.
Semantic interoperability	The jobs and workflows of the organisations in the data space share a vocabulary of meanings of the collected and shared data's definitions and meanings.
Technical interoperability	The data is translated to a standard graph format with shared annotation so that it can be easily exchanged, synchronized among partners.

Integrated service governance

REPREX

Algorithms that work for all

As members of the Dutch AI Coalition, we help public and private users adopt AI they can trust. Our solutions meet the strictest regulatory standards and are built for sensitive sectors—banking, cultural heritage, education—where fairness, transparency, and accountability are essential. We design AI systems that legal, auditing, and sustainability teams can confidently and conveniently control.

NL AI Coalitie

Big data for all

Our data sharing space model standardises access and governance, enabling public and private partners to share data safely for training AI. We connect open government, open science, and sector-specific datasets—so even small actors can benefit from large-scale, compliant data use.

BDV

Open technology for all

We build and maintain open-source libraries and components that extend the R data ecosystem and leading graph tools. But we don't stop at code—we customise, integrate, and deliver them as Software-as-a-Service (SaaS), so even small institutions can benefit without local IT support.

Open knowledge for all

Most organisations don't have access to true big data—but they can tap into big knowledge. We create shared, reliable knowledge bases from open and institutional sources, making high-quality data available to train algorithms that work for users, not against them.

YES! DELFT

reprex

Questions?

Reprex reprex.nl/contact

Daniel Antal www.linkedin.com/in/antaldaniel