EUROPEAN CENTRAL BANK
EUROSYSTEM

Digital Paradigm Shift

The economy as a network of contracts

Vision and the bridge to

Statistics, Analysis, Risk Management

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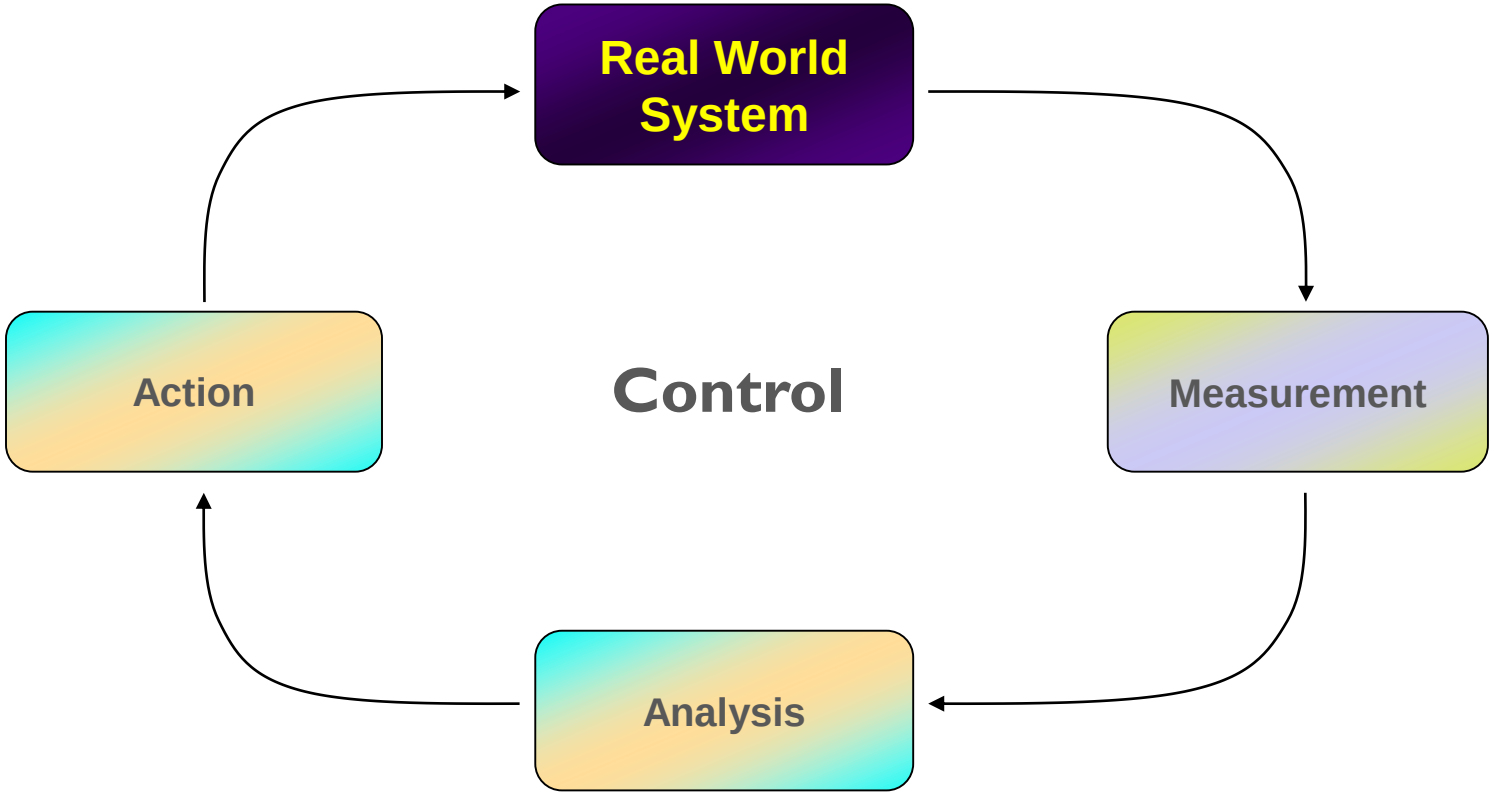


alert, fast, precise and fit survives

Technology is changing our world – sounds trivial? Think again

Tech

Smartphone
Cloud
ML
AI
DLT
IoT
5G
What next?
QC
NLP

what world in 10 years? 20 years?

EMERGING: an underlying global tech-"hyper-organism", messy – a new kind of risk:

"Technogenous" Risk, driven by ongoing, exponential growth of data volumes, speed, complexity, reach

Data

data wrangling, cleaning, fixing → **gradual failure**

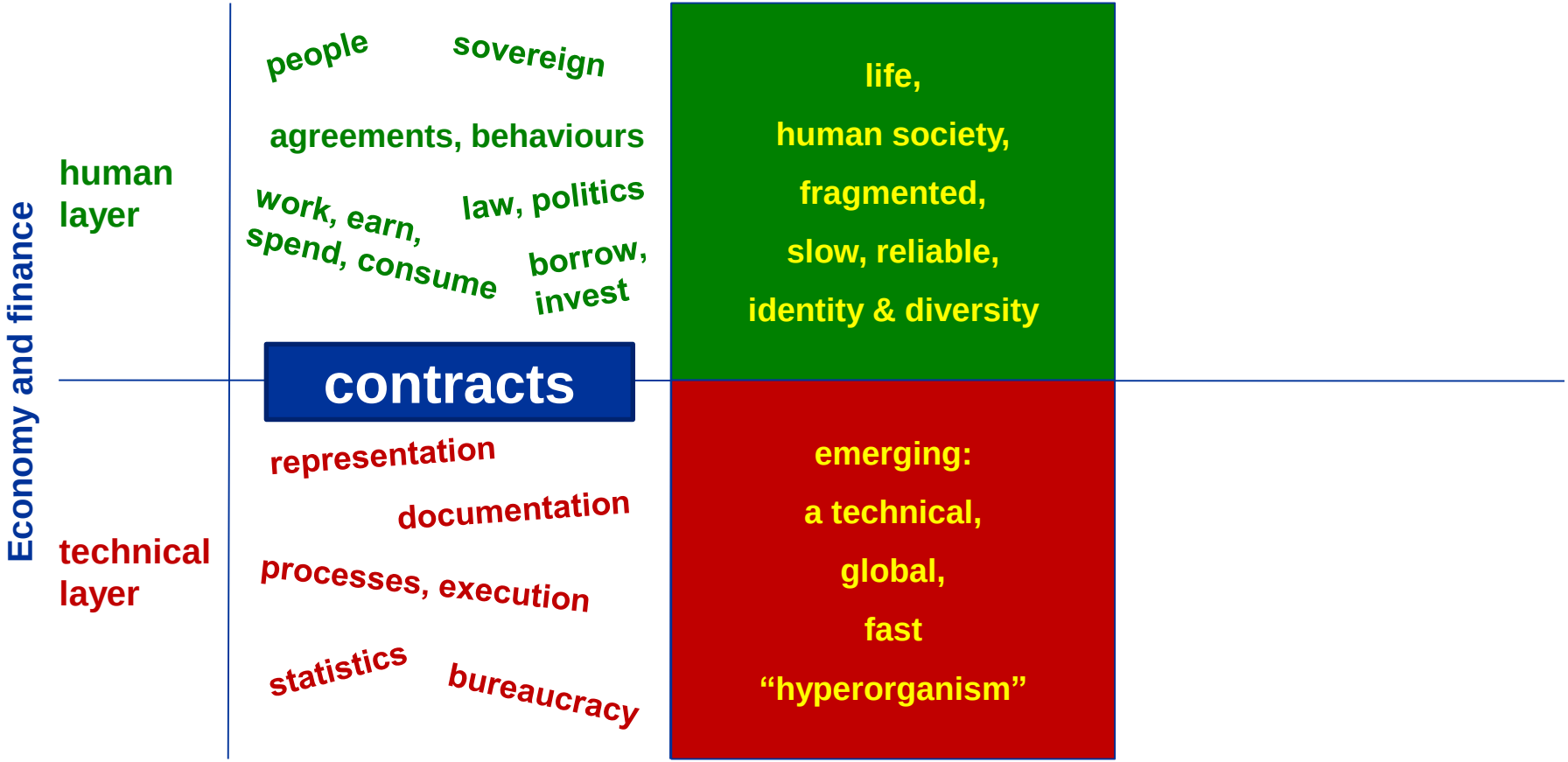
2020 2030 2040

society, economy and technology

-

the challenge

After three decades of digital revolution: a new technical reality underneath?



people and technology

-

the challenge

We need artifical senses to “see” economy and finance – reporting as usual won’t do much longer

the economy and finance are an entirely immaterial system.

o

We need artificial senses to ”see” them

o

at the speed and scale of the system.

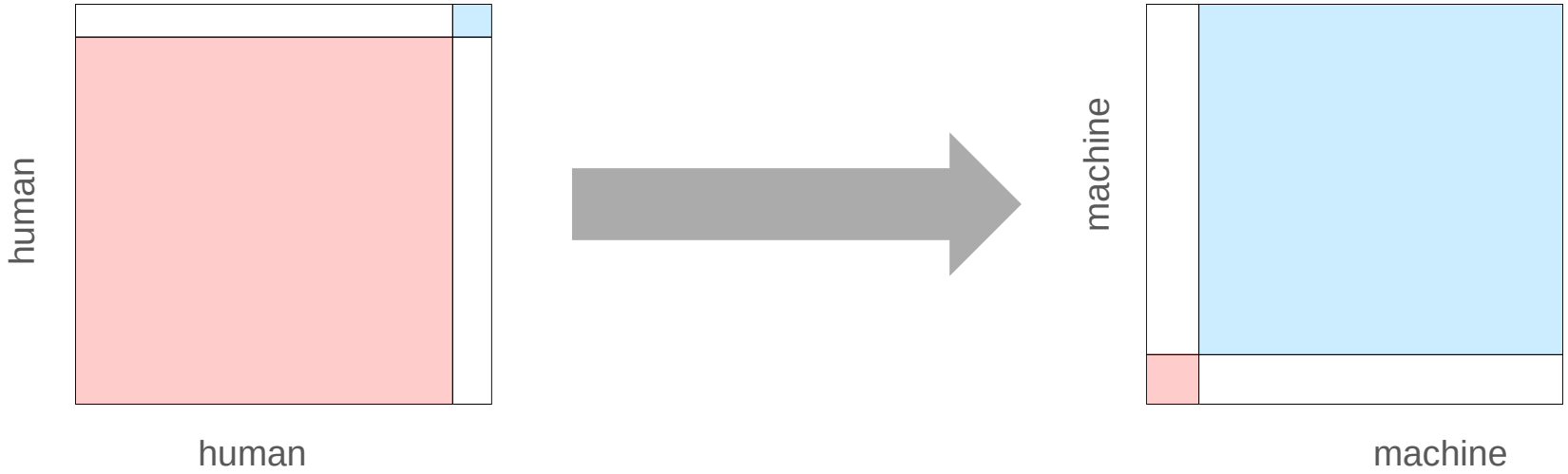
o

To build them, we must rethink the substance we measure:

o

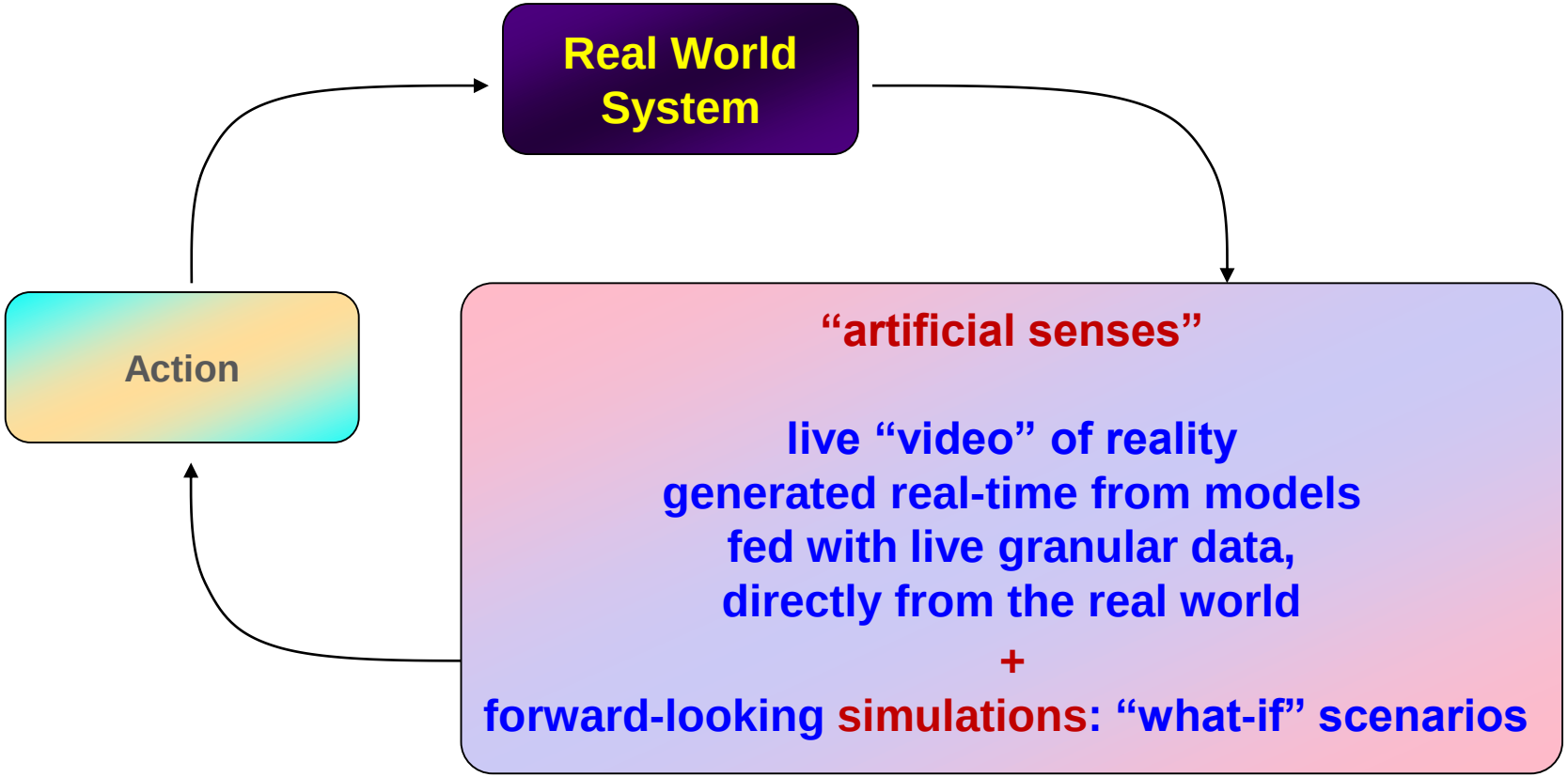
we need a vision, a theory of that substance to shape our concepts

Technology has shifted the human-machine interface



artificial senses
for the
economy and finance in the digital age
-
what specifications?

Control – when machines are endlessly bigger and faster than human brains



1. measure at scale and speed of the system (global, real time)
2. analysis flexible and fast enough to address sudden surprises
3. granular data serves system-level analysis (*)
4. large scale granular data
5. collected near time
6. data directly from operational systems to analytical systems, for speed
7. fully automated chain from reality through measurement to analysis
8. standardise data globally (identifiers first)
9. operational data standardised at sufficient depth, in all systems in markets
10. all contracts represented in a single, universal algorithmic language

(*) everything in a single agent-based model

iron age

stone age

digital age

what is data?
how will we master data?

bronze age

Chinese 人人生而自由

Persian همهٔ افراد بشر آزاد به

English All human beings are born free

Three fundamentally different approaches to language…

… and there are and were many more.

data is language!

…as diverse as human language…

…but computers need it clear and homogeneous

Data has become an obstacle to the delivery of the technology promise

Technology increases social complexity by connecting more diverse people…

…making agreement on standards

- increasingly
  - necessary
  - urgent
- more difficult
- much slower

→ to achieve

More IT can deliver value only if data quality improves

What strategy is possible?

The problem
- is deep, global, growing fast, potentially even to critical
- is beyond a single solution

A possible strategy: **transformational power**

- Feasible measures with immediate benefits to many across the system
- Designed to free potential for market forces to reconfigure the system

Standardisation is often at the heart of deep transformational processes.

Bar code

Shipping container

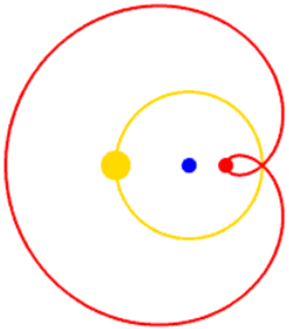
Time and date

Business English

vision

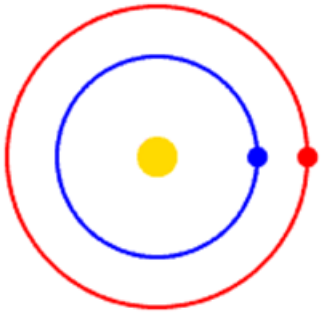
Vision: technical tool, not flight of fancy

- A way we choose to view the world
- A representation that structures our perception, shapes our joint action



The solar system
heliocentric (right)
vs.
Geocentric (left)

In red: orbit of Mars



- "*All models are wrong; some models are useful*" George E.P. Box, statistician
- "*It is the theory that decides what we can observe*" Albert Einstein
- "*Combining visions gives us more possibilities*" Hans Poser, philosopher

Source http://images.google.de/imgres?imgurl=https%3A%2F%2Fupload.wikimedia.org%2Fwikipedia%2Fcommons%2Fe%2Fea%2FApparent_retrograde_motion.gif&imgrefurl=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FCopernican_Revolution&h=256&w=512&tbnid=d-2Q8WwFkk4YVM%3A&docid=_D5z93ryjK14lM&ei=YJsIWLOZBqalgAaf4KuwAg&tbm=isch&iact=rc&uact=3&dur=1353&page=0&start=0&ndsp=28&ved=0ahUKEwizydymlenPAhUmBMAKHR_wCiYQMwg8KBgwGA&bih=773&biw=1536

A vision of the technical substance of finance better suited to emerging digital reality

- Our vision of digital finance conditions the solutions we can conceive together
- The technical substance underlying finance keeps changing radically, fast:

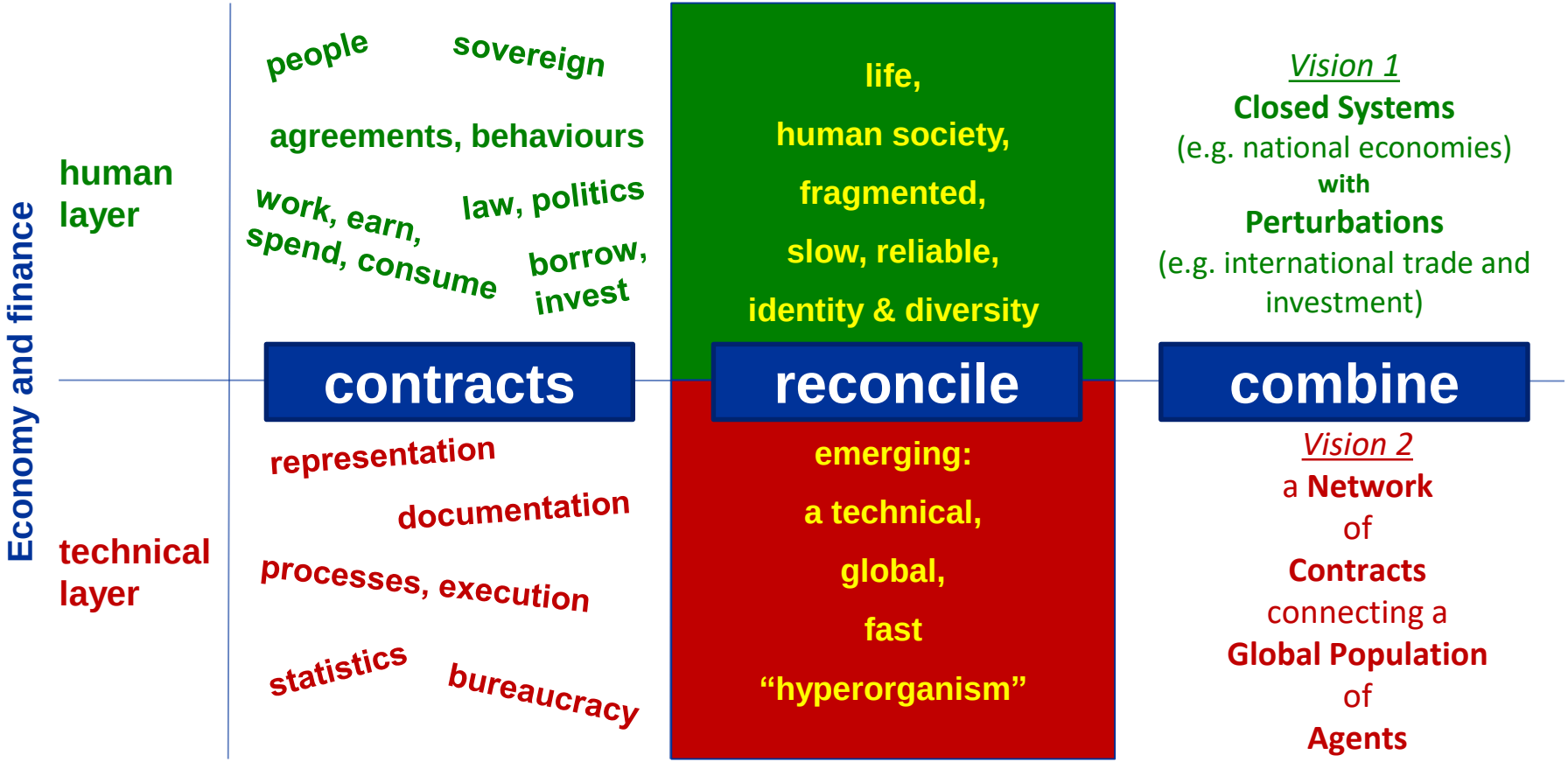
Global reach for all / **Speed** / Data **volumes** / **complexity**

- It helps to see the technical substance of digital-age finance as

a **Network** of **Contracts** connecting a **Global Population** of **Agents**

That vision was valid already in Roman times but not very important back then

After three decades of digital revolution: a new technical reality underneath?



a **Network** of **Contracts** connecting a **Global Population** of **Agents**

- Each contract, each party is anchored in one or more legal system
- The network is seamlessly global and very messy: the technical reality of markets
- Each node has a **contractual footprint** (1, 2 … n legs remote)
- Is the node a sovereign, the footprint reflects national economy and foreign trade
- Is the node a holding, the footprint reflects the group structure and its business
- Exposures: ask how an event impacts a given node through chains of contracts

Statistics, simulations and analysis from a single graph (the network) serve many questions, near (real-) time. And they are consistent.

Tech

Smartphone
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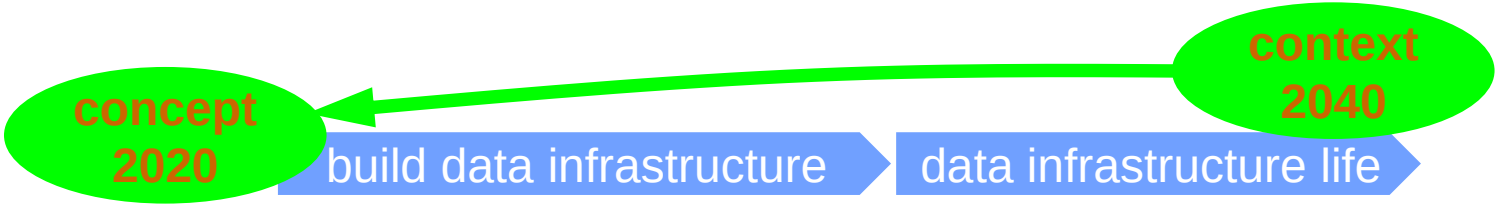
What next?

data infrastructure for the digital age

will last if built on

invariants



Possible path forward: standardise the digital representation of invariants we all agree upon

Law establishes social consensus, *e.g. about a legal entity*

Law makes an immaterial object into a fact, for all, globally

A fact can be given **identification** *(a name, a number)*

and

representation *(a data sheet, paper, photo)*

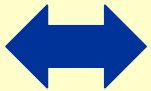
Law makes a legal entity into a fact, for all, globally

Law should also **mandate** a globally standardised, unique **digital representation** and **identification** of that legal entity

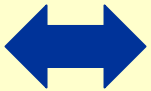
Possible path forward: standardise the digital representation of invariants we all agree upon (ctd.)

An operational solution could reflect a simple architecture:

each **object** that is fact by law



is given a single, globally standardised **digital twin** mandated by national law



stored in a global, public-good **data infrastructure**

Then, all processes use the same digital twin, interoperate more easily, globally

Global LEI System

and

Shared Data Infrastructure

The solution is there:

Global Legal Entity Identifier System

The Global LEI System is operational – it needs further development towards:

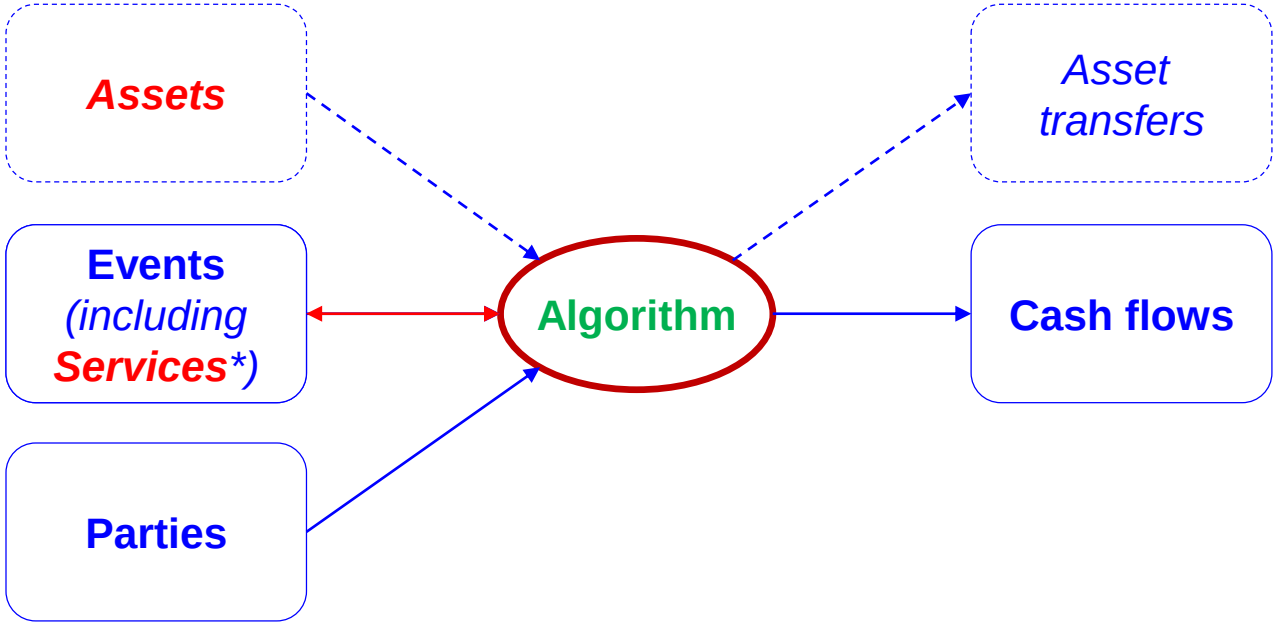
- Global, universal coverage, by law: every legal entity in every country
- Free for registrants and users
- Accurate in real time: users can trust the data represents official truth

The EU must not wait. We must mandate the LEI in the EU through

a new infrastructure law, e.g. an EU Directive

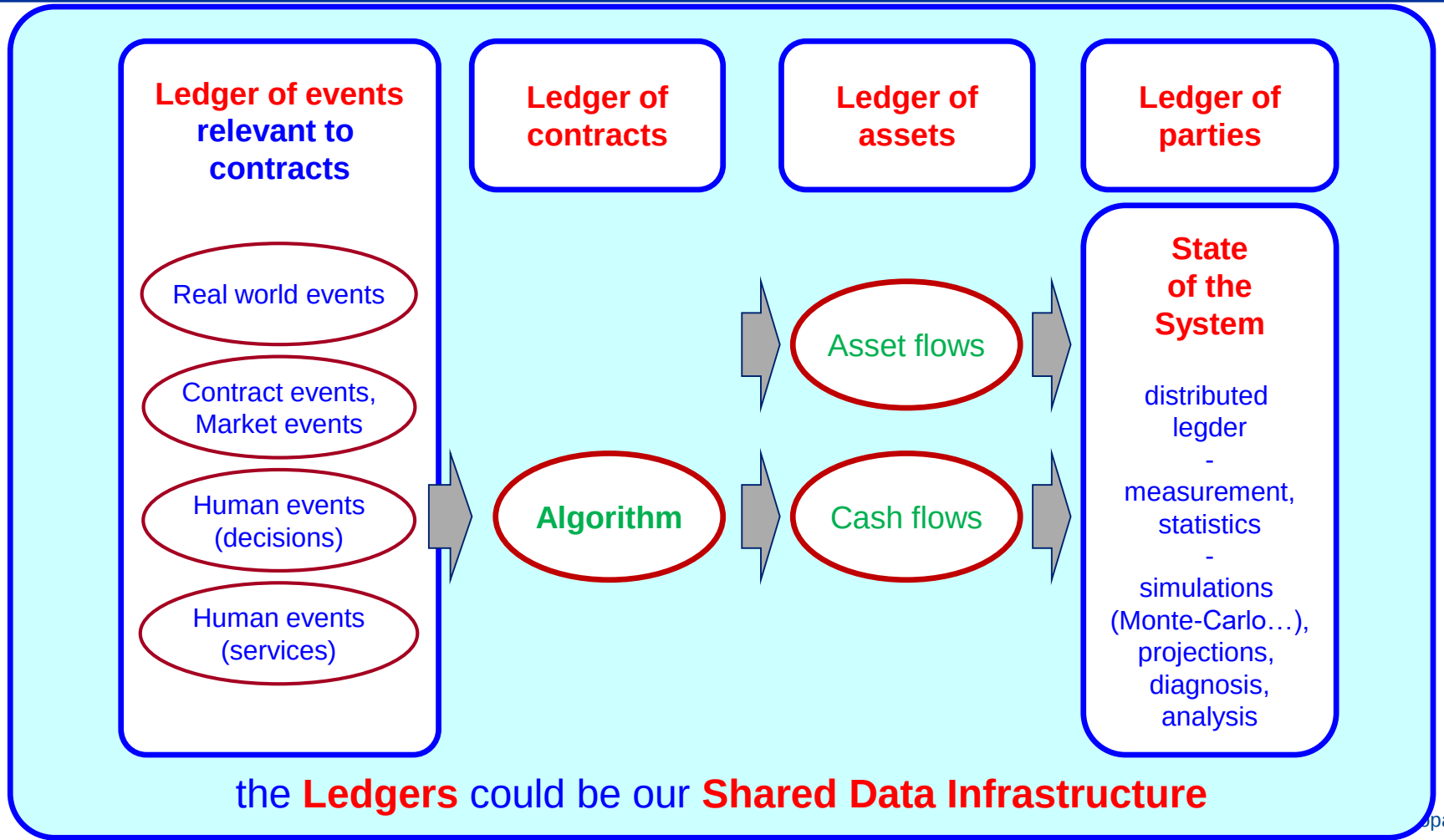
EU market authorities must lead the movement, in cooperation with the private sector

generalised here to cover all types of contracts (financial, goods, services)



** delivery of a service is treated as an event in this conceptual framework*

A suite of ledgers to represent the populations of contracts in a single language



the **Ledgers** could be our **Shared Data Infrastructure**

Smart Regulation: a long-term benefit from standardising identifiers and contracts?

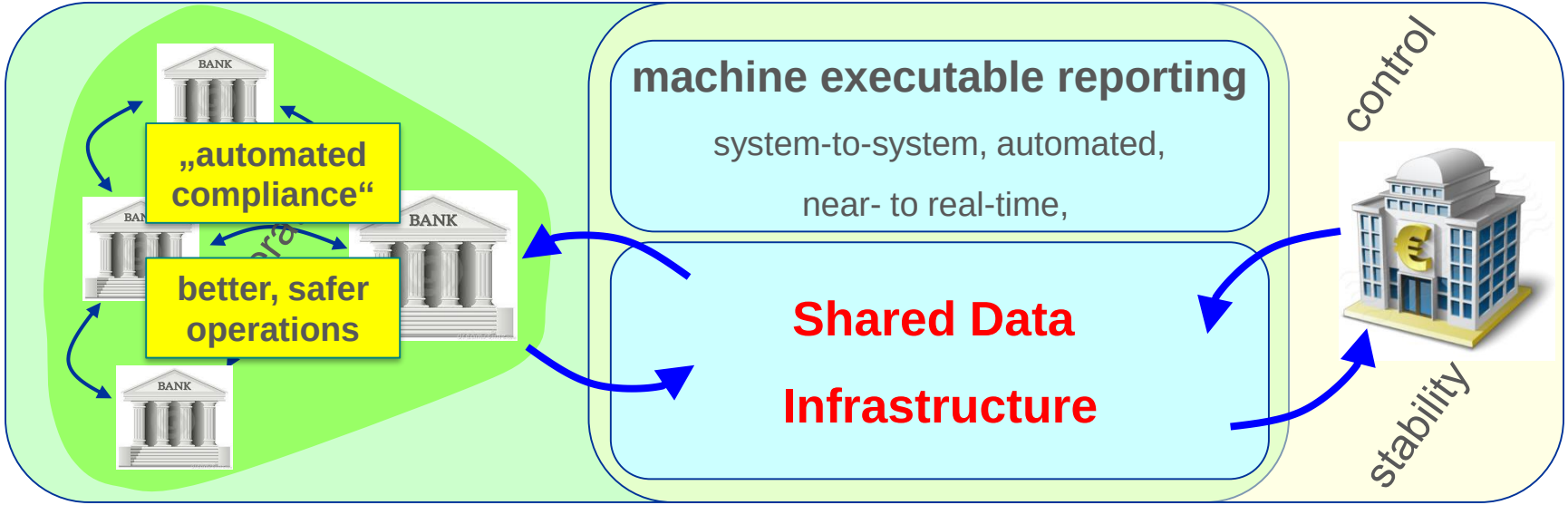
Ordnungspolitik *for* **Data**

„Smart Regulation“

Sound data infrastructure

gives markets more freedom, industry lower costs and risks while enabling low-burden, automated reporting for near-time, flexible, system-scale measurement and analysis.

Infrastructure is a public mission



Questions, comments, critiques, ideas thoughts and suggestions gratefully welcome

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