DIGITALIZATION IN THE CHEMICAL INDUSTRY

Presentation to the ECRN-DG CONNECT conference

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A recent ADL & CEFIC survey highlighted which sustainability-related activities benefit the most from the digital technologies

Survey

ADL / cefic

The survey analyses how digital technologies can be key enablers of a more sustainable future European chemical industry

50+
Companies participated

35+
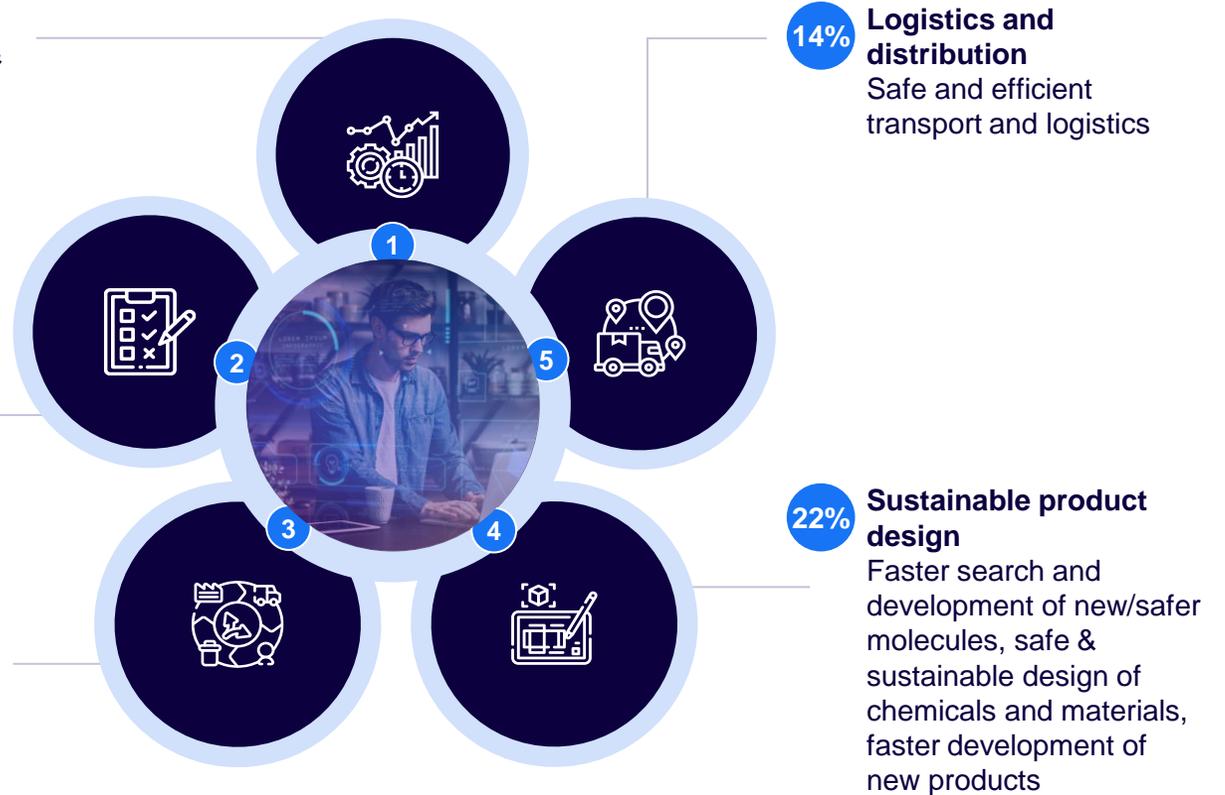Interviews with industry thought leaders

5
Expert roundtable sessions

20+
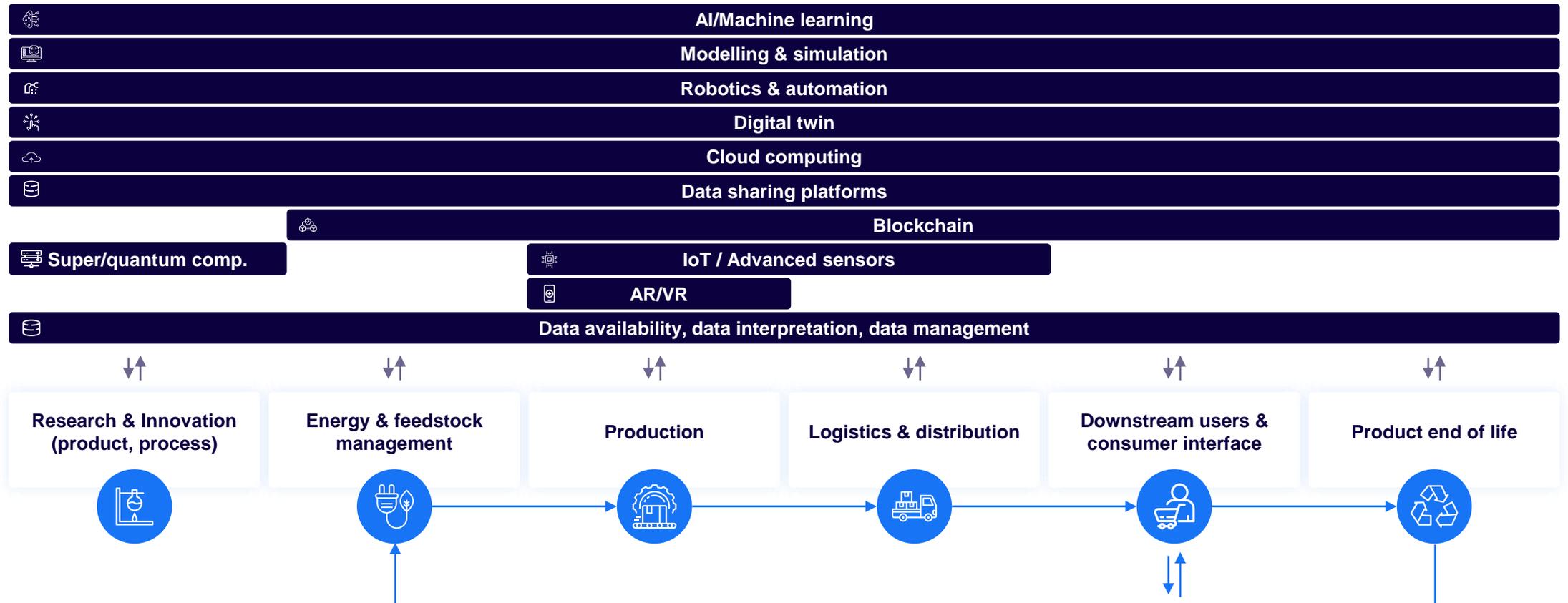World leading industry experts consulted

XX%: Mentioned by % of companies

58% **Process design and production for climate & circularity objectives**
Process design & optimization, energy & resource efficient production, renewable energy and alternative feedstock integration

38% **Sustainability assessments**
Calculation/ monitoring / transparency of scope 1,2,3 emissions, LCA

22% **Enabling materials and chemicals circularity through tracking and tracing**
Materials/ products tracking & tracing for circularity, digital product passport

14% **Logistics and distribution**
Safe and efficient transport and logistics

22% **Sustainable product design**
Faster search and development of new/safer molecules, safe & sustainable design of chemicals and materials, faster development of new products

Numerous digital technologies have a role to play – spread across the value chain

SELECTED RELEVANT TECHNOLOGIES FOR THE CHEMICAL INDUSTRY

AI/Machine learning

Modelling & simulation

Robotics & automation

Digital twin

Cloud computing

Data sharing platforms

Blockchain

Super/quantum comp.

IoT / Advanced sensors

AR/VR

Data availability, data interpretation, data management

Research & Innovation (product, process)	Energy & feedstock management	Production	Logistics & distribution	Downstream users & consumer interface	Product end of life

Sustainability assessments – AkzoNobel

Challenge

- AkzoNobel faced challenges in collecting and analyzing data on environmental impact and resource consumption
- They had increasing regulatory and customer pressure to improve the sustainability of its products and production processes

Solution

- AkzoNobel developed a digital sustainability assessment tool, called the Sustainable Impact Tool, which provides a detailed analysis of the environmental impact of each product, including carbon footprint, energy use, and water consumption, and identifies areas for targeted sustainability improvements
- This tool was based on LCAs, digital modelling and external sources

Results

- The Sustainable Impact Tool improved AkzoNobel's sustainability performance by reducing environmental impact and improving resource efficiency
- The tool supported informed decision-making on product development, and enabled transparent communication with stakeholders about sustainability performance

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Enabling material and chemical circularity through tracking and tracing – EASTMAN

Challenge

- Traceability of sustainable products across the entire value chain is needed to enable circularity
- It was vital for Eastman's sustainability story to understand where their products came from

Solution

- Eastman leveraged a blockchain-based platform to give visibility to the specialty plastics produced with the company's certified molecular recycling technologies
- Full data transparency was enabled

Results

- The platform provided consumers with traceable information on the sustainability attributes of products, including their percentage of certified recycled content
- This circular solution is fast becoming a key prerequisite for sustainable offerings made with renewable bio-based and molecularly recycled waste

Sustainable product design – SOLVAY

Challenge

- Solvay faced increasing pressure to reduce its environmental impact and develop more sustainable products

- The company wanted to develop a sustainable and cost-effective alternative to traditional polyamide materials that are widely used in the automotive industry

Solution

- Solvay developed a new polyamide material, called Technyl Red S, that is based on a renewable resource, castor oil, and is produced using a more sustainable process

- They used digital technology, including artificial intelligence, machine learning, and advanced analytics, to optimize the production process and reduce waste and energy consumption as well as a digital twin to simulate and test performance
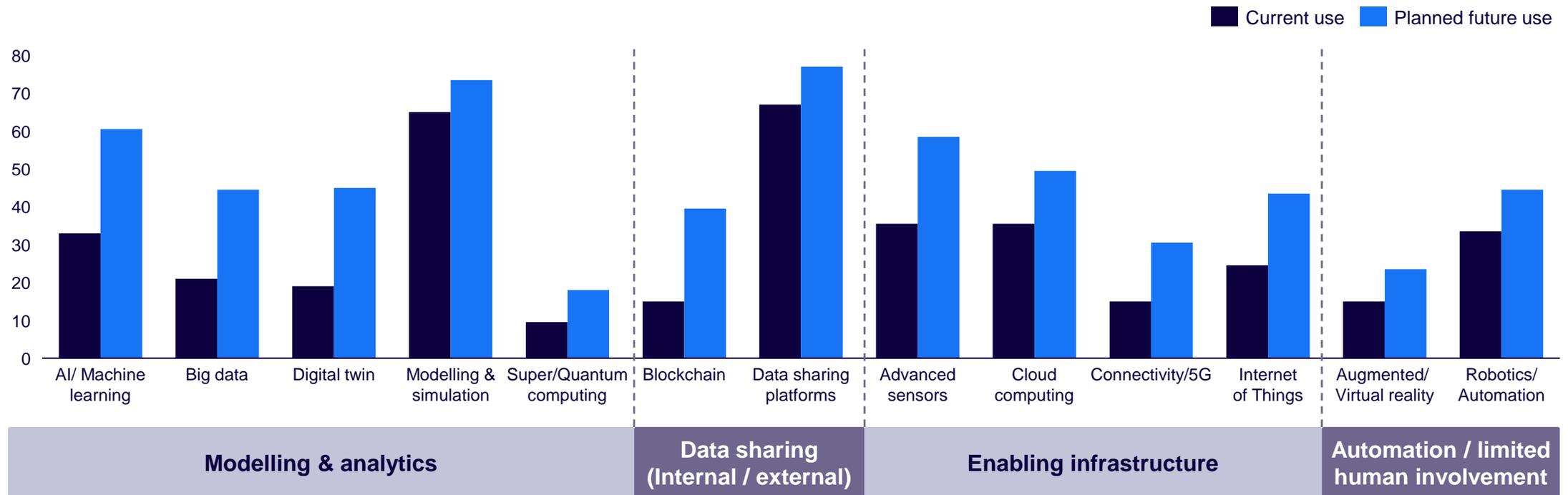
Results

- The use of digital technology allowed Solvay to optimize production and improve product quality, resulting in increased customer satisfaction and adoption of the new material in the automotive industry

Currently the focus of the industry is on modeling & simulation and data sharing platforms, but all topics are expected to be used more extensively in the future

DIGITAL TECHNOLOGIES CURRENTLY USED & PLANNED TO BE USED BY CHEMICAL COMPANIES
% of survey respondents using technology

Legend: ■ Current use ■ Planned future use

Categories (left to right):
- **Modelling & analytics**: AI/ Machine learning, Big data, Digital twin, Modelling & simulation, Super/Quantum computing
- **Data sharing (Internal / external)**: Blockchain, Data sharing platforms
- **Enabling infrastructure**: Advanced sensors, Cloud computing, Connectivity/5G, Internet of Things
- **Automation / limited human involvement**: Augmented/ Virtual reality, Robotics/ Automation

The above technologies and their applications are contingent on reliable data and the first step towards exploiting these technologies is a robust data setup

Data Sharing is an emerging strategic enabler of sustainability – establishing value sharing based on trust is the number one prerequisite

Technology enablement

Regulation & government facilitation

VALUE

1

BUSINESS ALIGNMENT

2

TRUST
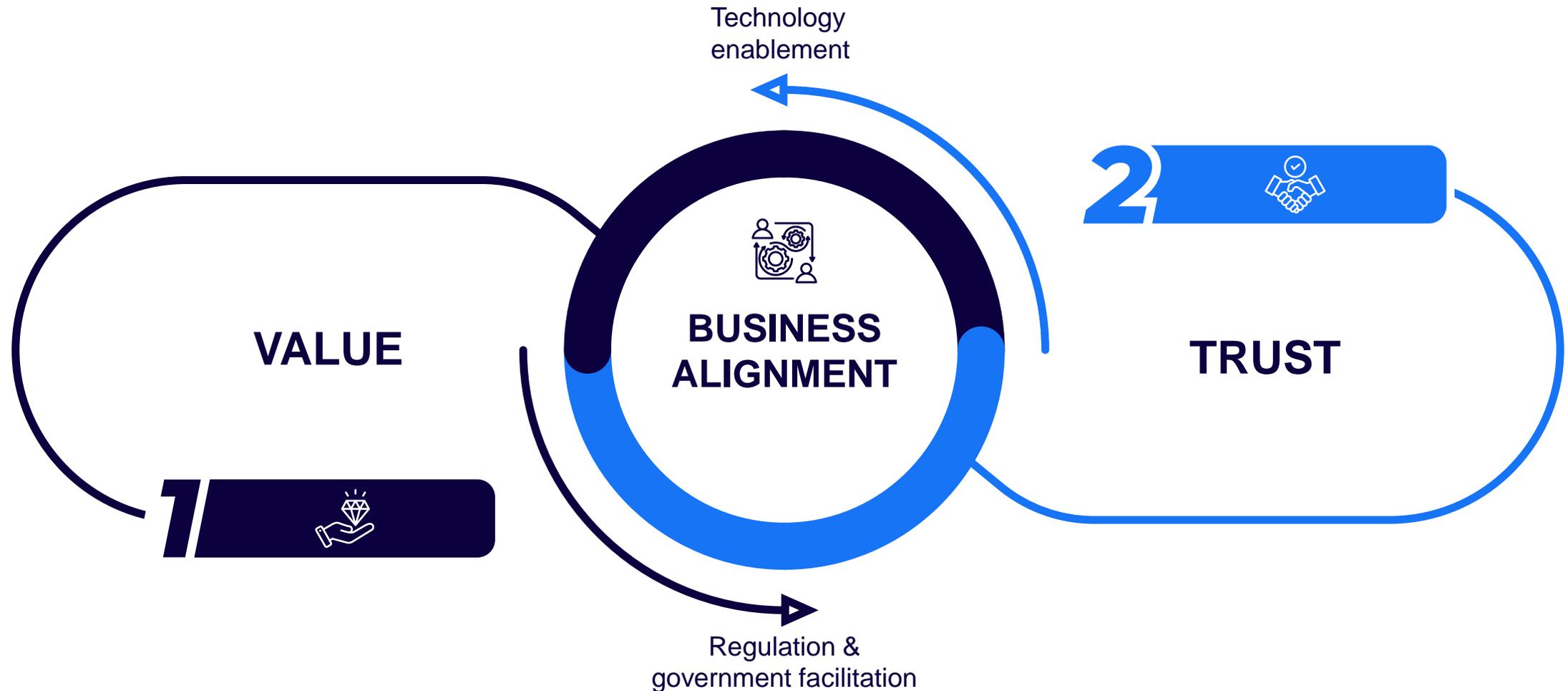
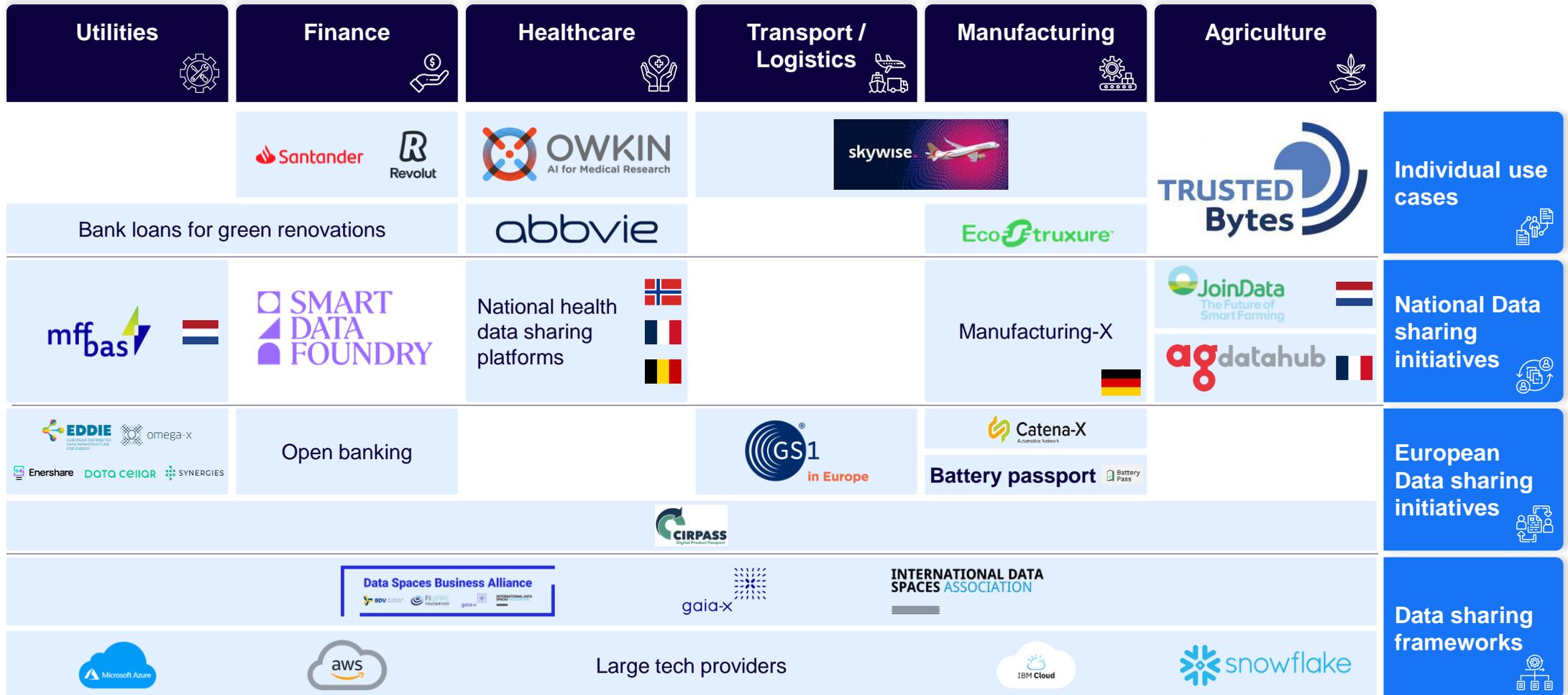# Data Sharing is an emerging strategic enabler of sustainability as well as innovation and regulatory compliance

EXAMPLES

Utilities	Finance	Healthcare	Transport / Logistics	Manufacturing	Agriculture	
	Santander / Revolut	OWKIN AI for Medical Research	skywise		TRUSTED Bytes	**Individual use cases**
Bank loans for green renovations		abbvie		EcoStruxure		
mffbas	SMART DATA FOUNDRY	National health data sharing platforms		Manufacturing-X	JoinData The Future of Smart Farming / agdatahub	**National Data sharing initiatives**
EDDIE / omega-x / Enershare / DATA CELLAR / SYNERGIES	Open banking		GS1 in Europe	Catena-X / Battery passport		**European Data sharing initiatives**
		CIRPASS Digital Product Passport				
	Data Spaces Business Alliance	gaia-x	INTERNATIONAL DATA SPACES ASSOCIATION			**Data sharing frameworks**
Microsoft Azure	aws	Large tech providers		IBM Cloud	snowflake	

Source: Arthur D. Little

Companies report a wide range of other challenges to be overcome in the coming years

Technological · Organizational · Financial · Human capital

Technology Readiness

Data Availability

Inter-Operability

Cybersecurity

Standardisation

It Infra-Structure

Prioriti-Sation

Competitive-Ness

IP Protection

Alignment

Implementation time

Change Management

Digital skills

Limited Resources

Required Investment

Increased Costs

Source: CEFIC, Arthur D. Little

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Our consultants have strong practical industry experience combined with excellent knowledge of key trends and dynamics. ADL is present in the most important business centers around the world. We are proud to serve most of the Fortune 1000 companies, in addition to other leading firms and public sector organizations.

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