



Integrated Worlds
ANNIVERSARY

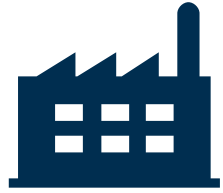
Klaus Bröhl
Founder & Managing Director



 Furniture-X

Development of a Data Ecosystem for the Furniture Industry

Furniture - Best of German Mittelstand!



433

433 manufacturers generated sales of circa **€ 16,5 billion** in 2024 *1 (cf. - the **3 major German car manufacturers** in total approx. **€ 280 billion**).

The sector is a **typical example for German SMEs!**



1.000.000.000

The products are **extremely varied** and the **content standardization** of product data is **low**.

A standard product in the upholstered furniture category can have more than a **billion variants**.



194 KG

The industry is **diverse in terms of product groups** and **materials** used as well as the **duration of product use**.

The **use of** recycling options for **raw materials** is currently **far too low**. **194 kg of bulky waste** is disposed of per inhabitant *2

There are therefore numerous interfaces with other sectors



16.000

This is roughly how many companies are part of the industry in Germany alone.

The **value chain is deep** and the **processes** from ordering to production, logistics, assembly, repair and recycling **are complex**.

The landscape of specialized **IT systems** is just as complex.



EU

The **Ecodesign Regulation** was recently passed and the furniture industry will be one of the first to implement it.

CSRD, Green Claims, Taxonomy and, if applicable, **CPR** will justify further requirements.

ESPR 

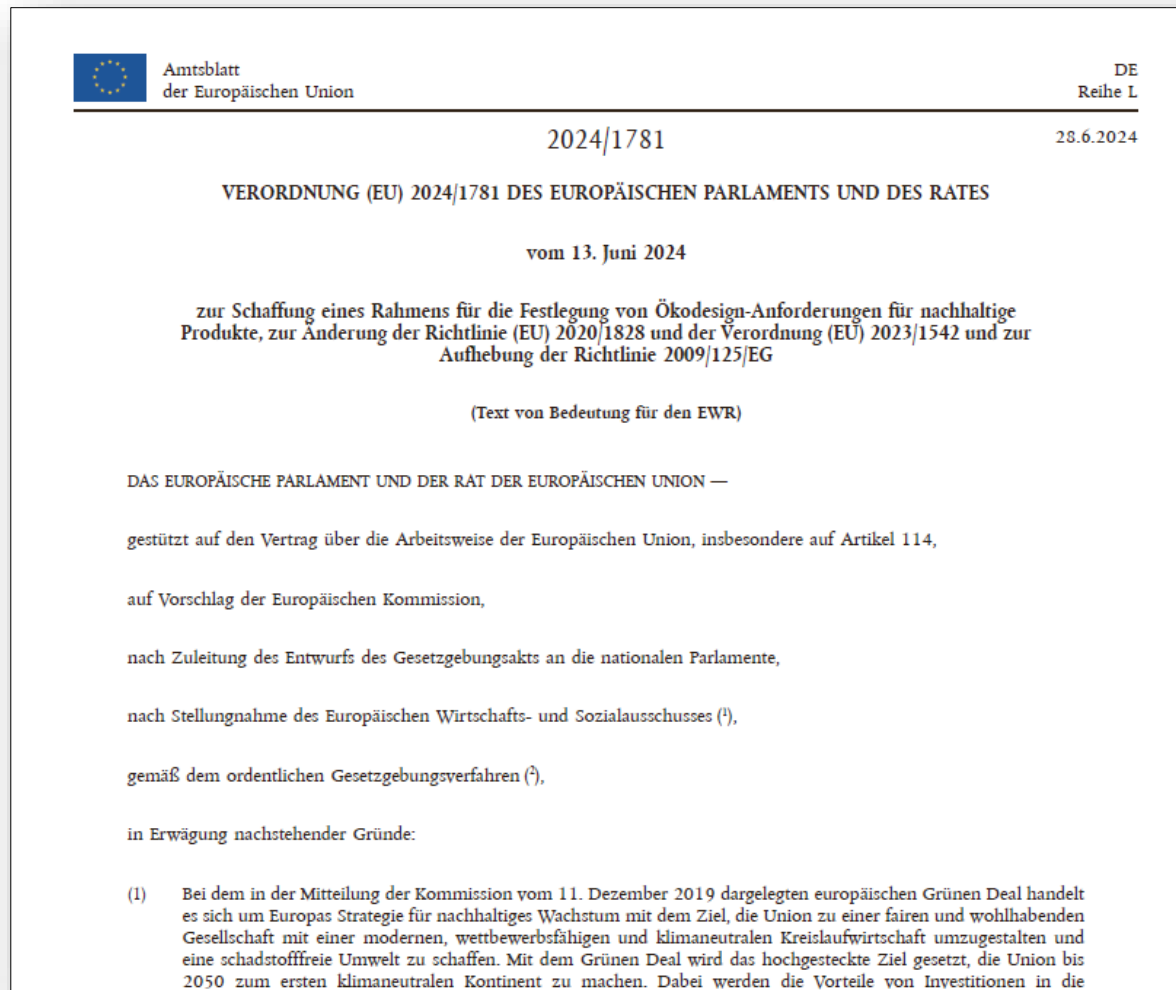
**Ecodesign for Sustainable
Products Regulation**

EUDR 

**European Union Deforestation
Regulation**



Ecodesign for Sustainable Products Regulation (ESPR)



[..] products can only be placed on the market ...if a product passport is available

(Art. 8 (1))

**NO DATA
NO MARKET!**





Timeline – Introduction of the Digital Product Passport

Product group	Rank	Expected / Delegated acts
End products		
Textiles / Clothing	1	2027
Furniture	2	2028
Tires	3	2027
Mattresses	4	2029
Intermediates		
Iron / Steel	3	2026
Aluminium	4	2027

+18 months until validity









Foundation of Furniture-X

February 29, 2024 – “Möbelfachschule” in Cologne

The network as a success factor for the concrete roll-out



<p>The associations & umbrella initiatives</p> 	<p>Data Competence Center</p> 	<p>Integrated Worlds</p> 	<p>Morphe</p> 	<p>Wuppertal Institute</p> 	<p>FIR</p> 
<ul style="list-style-type: none"> ✓ 450 Manufacturer ✓ 8,500 dealers ✓ All relevant affiliated groups 	<ul style="list-style-type: none"> ✓ Approx. 80 companies ✓ 270 committed people ✓ Worldwide use of IDM standards 	<ul style="list-style-type: none"> ✓ 1,000+ participants ✓ All relevant systems networked 	<ul style="list-style-type: none"> ✓ 12 years of product information management ✓ 4 ECLASS industry models 	<ul style="list-style-type: none"> ✓ Top network in science, research and politics ✓ 6 CE projects ✓ 10 Industries 	<ul style="list-style-type: none"> ✓ 70 years of experience ✓ 5+ active projects in the digital circular economy ✓ >50 enrolled companies
<ul style="list-style-type: none"> • As the leading association for manufacturers, the VDM represents all sectors of the industry both nationally and internationally • The German Home & Office Retail Association (BVDM) represents the interests of around 8,500 companies in the specialist retail sector. • The Mittelstandsverbund/ ZGV represents the commercial association groups. All relevant association groups in the sector coordinate their activities in the Furniture & Kitchen specialist group 	<ul style="list-style-type: none"> • Organizer of standardization committees in all relevant industry sectors such as home furniture, kitchen & bathroom. • Designer of the globally used Integrated Data Format (IDM). • Co-initiator of Moebel Digit@l • ECLASS Furniture and derived models specialist group • Active member of DIN/DKE for DPP • Associated project partner in furnFUSION 	<ul style="list-style-type: none"> • Operates IWOfurn as an established platform for data exchange • Connects more than 1,000 companies in daily business (65 million transfers/year) • Open concept and interfaces to all relevant system providers • Pioneer for operating models suitable for SMEs in the industry with services for the active networking of all companies • Implementation partner for furnFUSION • Project member of R-evolve 	<ul style="list-style-type: none"> • Product information management (PxM) consulting in industry-wide scenarios for retail and manufacturing • Collaboration in the following relevant initiatives <ul style="list-style-type: none"> • ECLASS specialist group "50 Furniture, home furnishings" • Internal ECLASS working groups • Head of ECLASS WebService • Head of ECLASS Product Environmental Footprint • ECLASS BIM TaskForce • ECLASS WoT Semantic RDF-Representation 	<ul style="list-style-type: none"> • Strong focus on digital circular economy and resulting business models • Involved in the development of DPPs and data spaces across industries • Advising the EU Commission and the German government on the following topics • Active in standardization activities on DPP and the circular economy 	<ul style="list-style-type: none"> • Development of business models in a scientific and entrepreneurial context • Analysis and design of application-oriented and circular ecosystems • Integration of operational application systems (ERP, MES) • Support for SMEs for low-threshold entry into the GAIA-X world (e.g. URANOS-X)

The network as a success factor for the concrete roll-out



Integration of the industry

Use cases & concrete pilots

- Definition of suitable **reference processes**
- **Requirements** for and feedback on the concept
- **Practical integration** / validation of the results
- **Beacons** for the utilization of results

3-5 supply chain companies from the network

nolte
KÜCHEN

POLIPOL
UNTERNEHMENSGRUPPE

Integration of specific pilots & holistic representation of the industry



User reports & blueprints for the rest of the industry



Public relations work and support from multipliers

Implementation of DPP integration

Definition & design of the AAS submodel

- Development of **basic technologies** and knowledge transfer (AAS)
- **Requirements documentation** for the implementation of a **submodel**
- **Conception and definition** of the submodel
- **Documentation of the application guidelines** based on the reference processes

Daten
Competence
Center e.V.

morphe*
Customer Data Technology

Technical infrastructure for the integration of the DPP AND existing infrastructure of industry players

- Development of **basic technologies** such as IDS and reference models for industry communities such as **Gaia-X Foundations**
- Definition of **measures for interoperability** according to analysis of the state of the art and infrastructure of the industry
- Implementation of **infrastructure for the DPP along the value chain** and integration of existing digital infrastructure

Integrated Worlds
we connect worlds

Know-how development and transfer

Cross-sector harmonization

Knowledge transfer and coordination

- **Knowledge transfer / expertise** from several sectors
- **Control and coordination** of planning with regard to harmonization with **cross-sector projects**
- **Circular economy orientation**

Wuppertal
Institut



Targeted integration and coordinated exchange

Associated organs

VDM
Verband der Deutschen Möbelindustrie e.V.

BVDM
Handelsverband
Möbel und Küchen

DER MITTELSTANDSVERBUND
ZGV
 Daten
Competence
Center e.V.

Integrated Worlds
we connect worlds

Moebel Digit@l
THINK TANKS

Media / Information

Moebel Digit@l

**möbel
fertigung**

möbelkultur

MÖBELMARKT.

moebelnews.de
die möbelbranche in echtzeit

INSIDE
WIRTSCHAFTSZEITUNG

Relevant break over initiatives, including e.g.

**PLATTFORM
INDUSTRIE4.0**

IDTA

CIRPASS
Digital Product Passport

**INTERNATIONAL DATA
SPACES ASSOCIATION**

gaia-x

**Fraunhofer
IESE**

Fraunhofer-Institut für Experimentelles Software Engineering IESE

CLASS

Relevant internal industry initiatives

Integriertes
Datenmodell

VDM
Verband der Deutschen Möbelindustrie e.V.

BVDM
Handelsverband
Möbel und Küchen

IWOform
Integrated Worlds Of Furniture

DER MITTELSTANDSVERBUND
ZGV

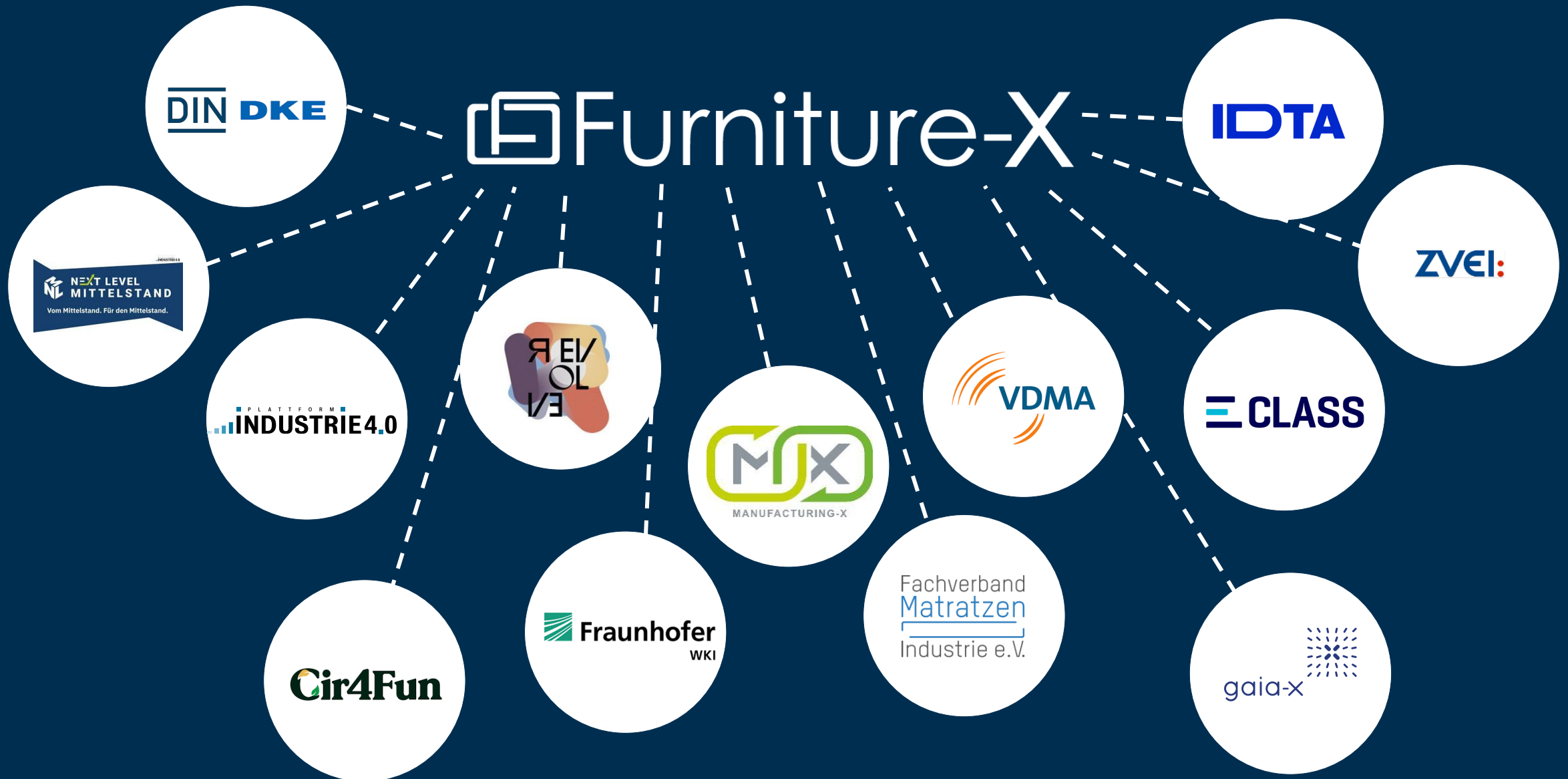
furnFUSION

Accompanying expert advice

The expert advisory board

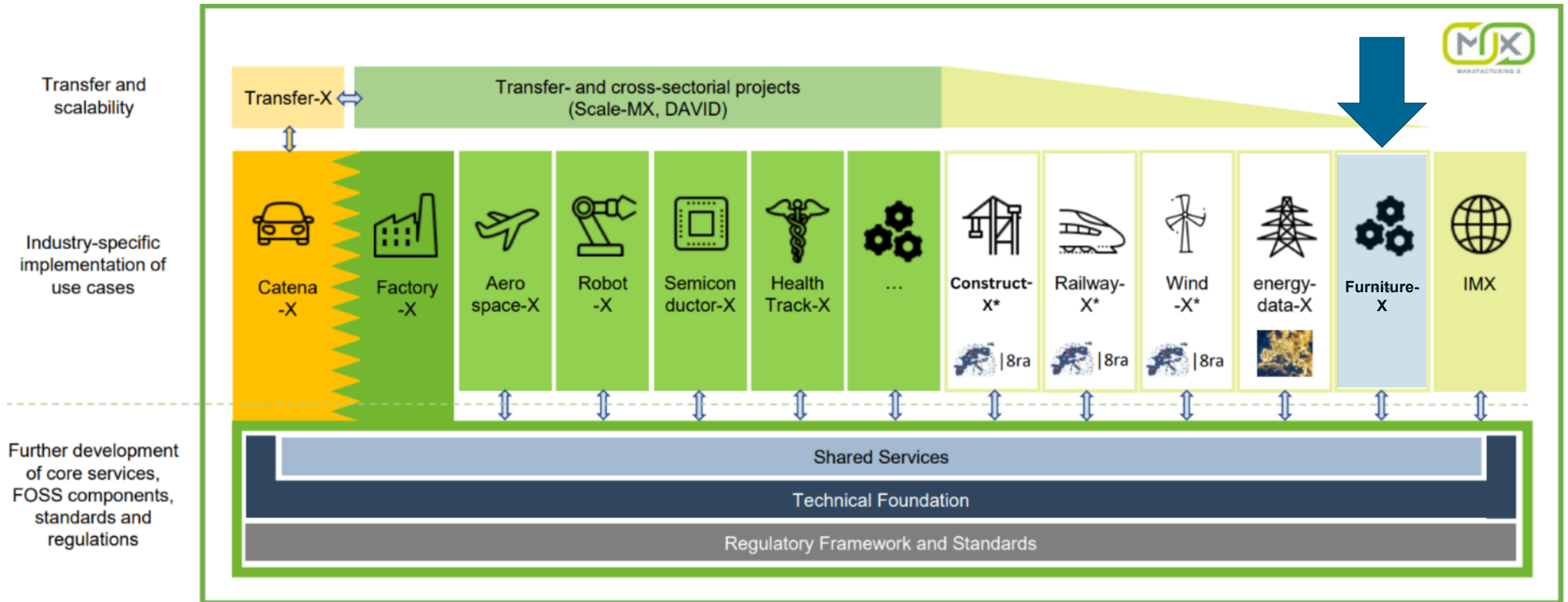
Name	Organization	Email Address	Key Facts
Martin Auerbach	Fachverband Matratzenindustrie e.V.	martin.auerbach@heimtex.de	Existing showcase (mattresses, home textile); Exchange of experience and direct reference to furniture; Synergy with the "Polster" demonstrator
Heiner Strack	Verband der deutschen Möbelindustrie e.V.	h.strack@moeblindustrie.de	Relation to the EU level for standardisation and regulation; A look at content regulation beyond the sub-area "DPP"
Ernst Esslinger	Formerly Homag AG	ernst.esslinger@outlook.de	Expert for added value through the use of digital twin concepts; Reference to Industry 4.0; Driving force beyond regulation (added value through "Additional Services")
Tim Geiser	Der Mittelstandsverbund – ZGV	t.geier@mittelstandsverbund.de	Relation to the EU level with regard to regulation; Perspective from the point of view of associations and retailers, across all sectors
Martin Führ	Hochschule Darmstadt	martin.fuehr@h-da.de	Expert on legal certainty issues; Relation to EU level regarding Law/regulation in the wider circular economy environment
Thorsten Kroke	ECLASS e.V	kroke@eclass-office.com	Impulse generator regarding modelling content; Bridge between ECLASS and IDTA; Bridge to value chains towards trade and consumers and many other industries
Meik Billmann	IDTA – Industrial Digital Twin Association	meik.billmann@idtwinn.org	Link regarding IDTA / AAS for Everybody; Link to other sectors / industries
Raoul Klingner	Fraunhofer-Institut für Holzforschung, Wilhelm-Klauditz-Institut WKI	raoul.klingner@wki.fraunhofer.de	Link to the wood industry; Contact to the VHI, the Association of the German Wood-Based Panel Industry e.V., in coordination with the Managing Director Ms. Anemon Strohmeier

An excerpt of cross-links to other initiatives



Furniture-X – Data Ecosystems compatible with Manufacturing-X

(but no public fundings ;-(!)



Die Architektur hinter Manufacturing-X

© Bundesministerium für Wirtschaft und Klimaschutz (BMWK)

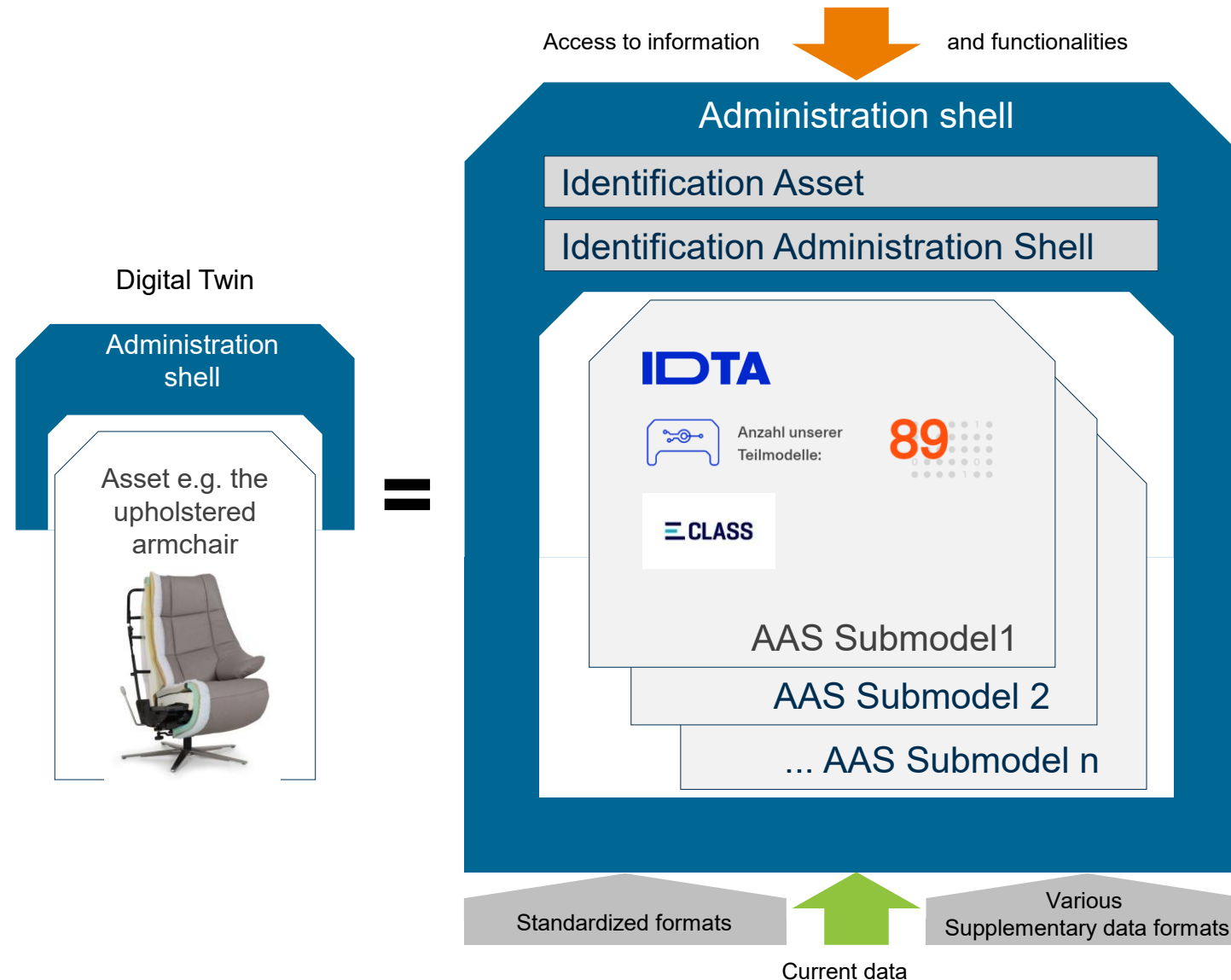


The administration shell AAS - Asset Administration Shell

A standard for the setup and provision of
digital twins and the DPP also for
furniture?



Building digital twins with the AAS (including furniture)



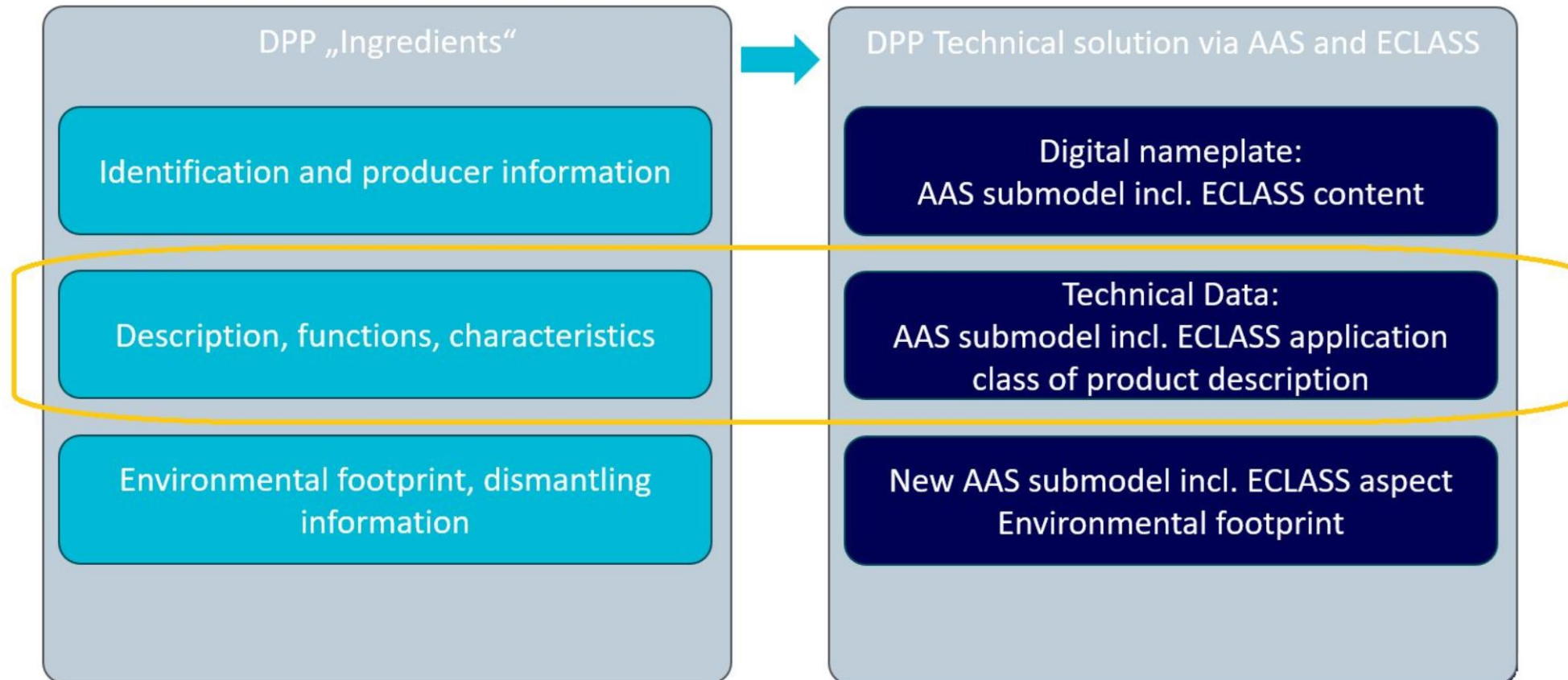


The ontological basis of the AAS is ECLASS!

THE DPP AND ECLASS

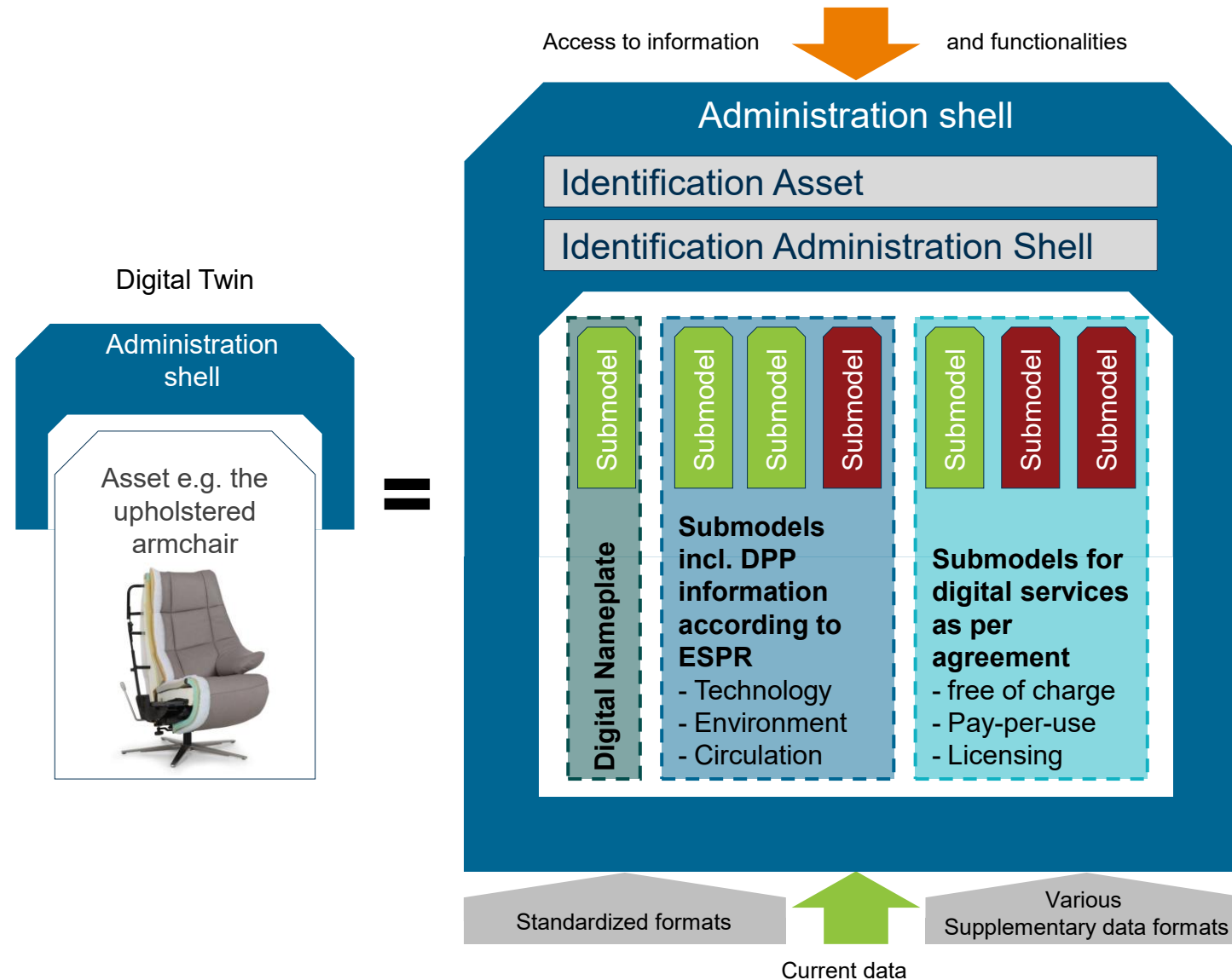


THE REQUIREMENTS OF THE DPP ARE SOLVED IN ECLASS





Digital twins – DPP regulations and business potentials!





Variants of the Digital Twin and the DPP: Model vs Instance

Model



Represents the type
version of a product
Catalog, manufacture
product number, brand

Configuration, Ordering, Production

Adoption of generic properties



Instance



represents a uniquely
identifiable product:
etID, Serialnr, Batchnr,
Lotnr

[..] The manner in which the
product passport shall be made
accessible to customers before
they are bound by a sales
contract

(Art.8 (2e))

Why do we need product hierarchies?

- Variety of variants, especially in view of configuration products e.g.

- 10+ fabric groups
 - 50+ colors (500+)
 - 6+ basic variants (3.000+)
 - 20+ basic elements (60.000+)
 - 10+ functional options (600.000+)
 - 0-4 headrests (2.400.000+)
 - = many different options (nn.nnn.nnn+)
- Impact on durability, reparability,...



- ESPR-relevant information is attached to individual components

„A component is a product!“ (ESPR)

→ In order to be able to calculate the required values at any time, we need the BoM



Types of BoMs



Engineering BoM (EBOM)

The Engineering BoM represents the product as designed by engineering:

- Derived from CAD and product design data
- Shows engineering structure, assemblies and components
- Shows the product from a functional and design-intent perspective



Manufacturing BoM (MBOM)

The Manufacturing BoM is focused on the parts that are needed to manufacture a product:

- Contains all materials, parts, subassemblies, quantities, and process-relevant information
- Includes information about relationships between parts
- Used across production systems for procurement, scheduling, assembly



Service BoM

The Service BoM focuses on spare parts, maintenance components, service processes

- Lists replacement and wear parts
- Documents maintenance and repair instructions
- Supports lifecycle management and spare parts management

BoM - Hierarchy

Product:

Kitchen

Components:

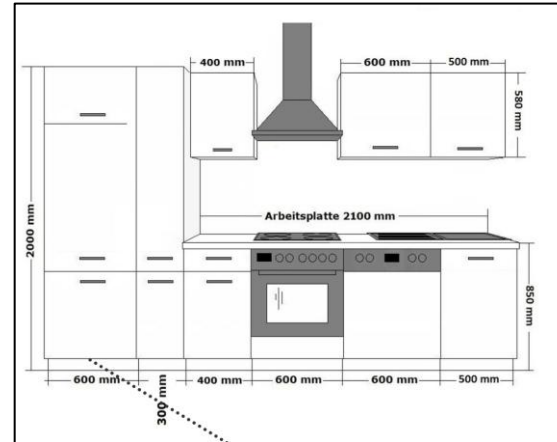
Furniture (base cabinet, tall cabinet, wall cabinet)

Worktops

Electrical appliances (oven, refrigerator, dishwasher)

Accessories (handles, plinths, lighting)

....



Product:

e.g. base cabinet

Components:

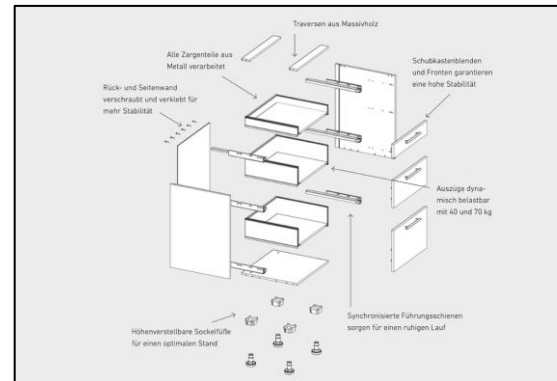
Cabinet Body (Carcass)

Fronts

Drawers / Pull-Outs

Adjustable Feet

.....



Product:

"Drop-down/Flap hinge"

Components:

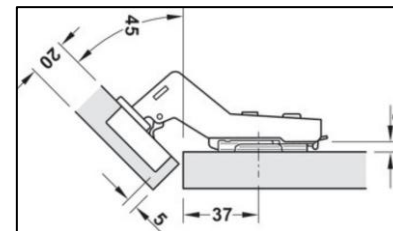
Hinge cup (top part)

Hinge arm

Mounting plate

Fixing screws

.....



Administration
shell

kitchen

Administration
shell

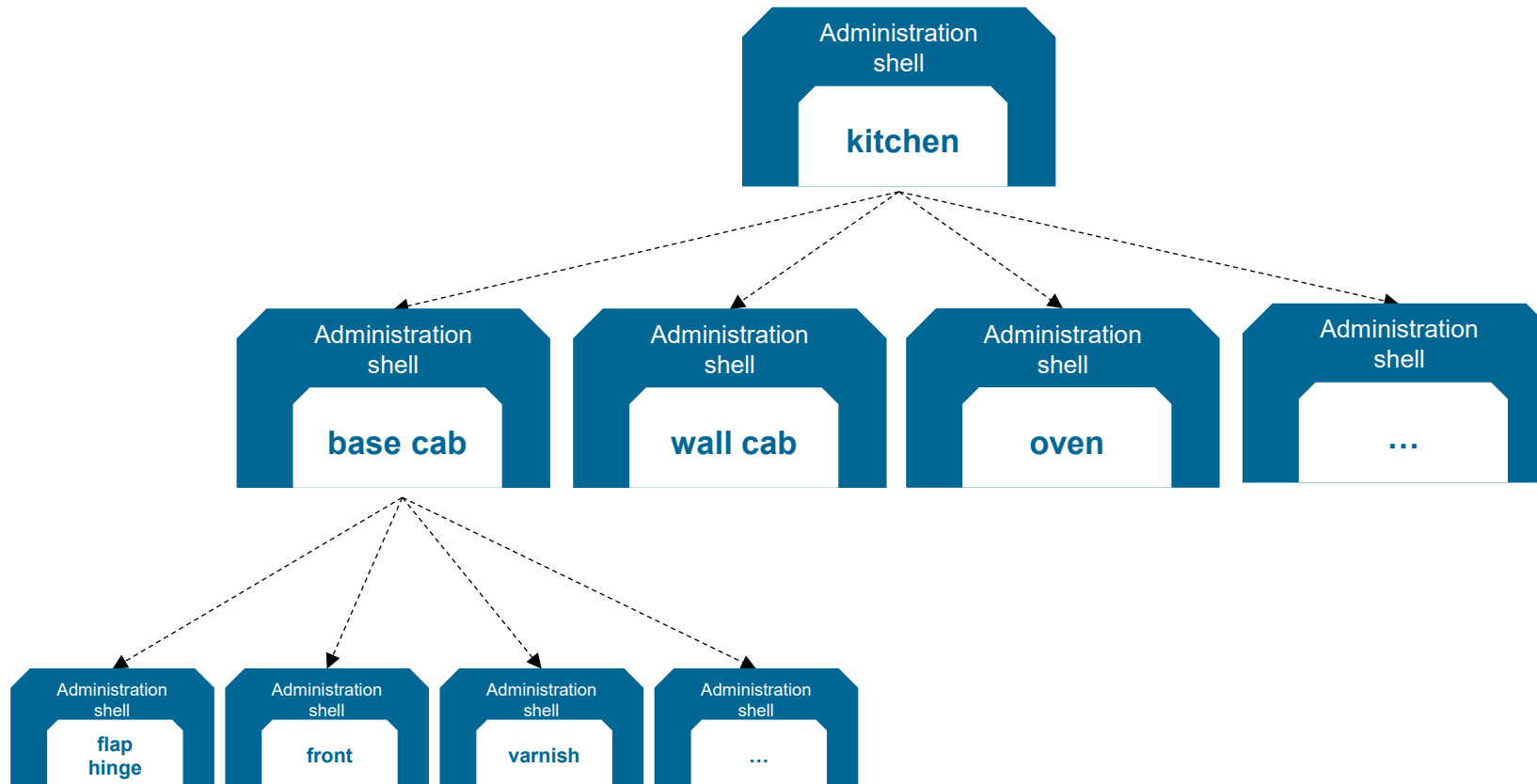
base cab

Administration
shell

flap hinge

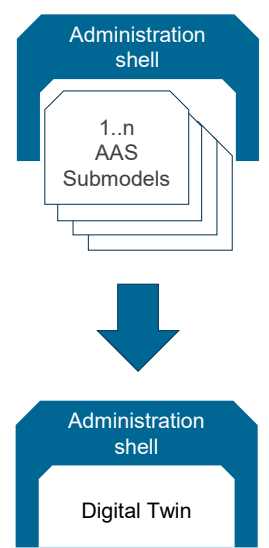


BoM – Hierarchy | AAS + ECLASS



Digital twins with the AAS meet the requirements of the furniture industry!

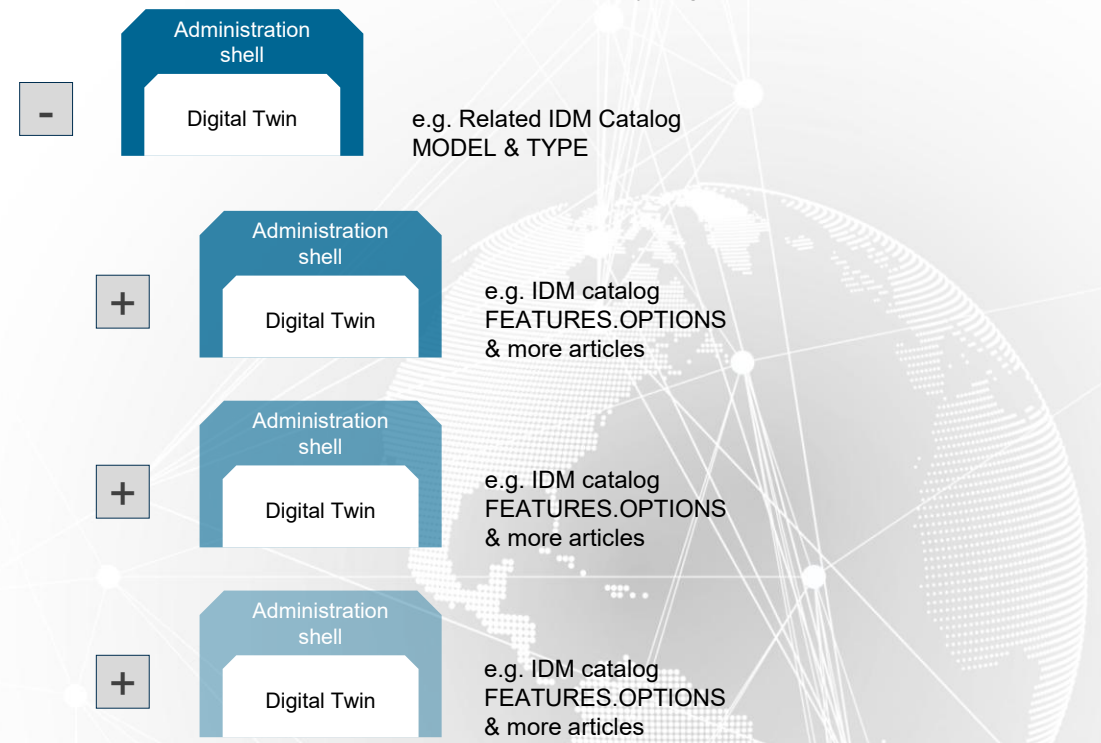
Digital Twin & AAS Submodels



Complex variant articles



Complex variant articles





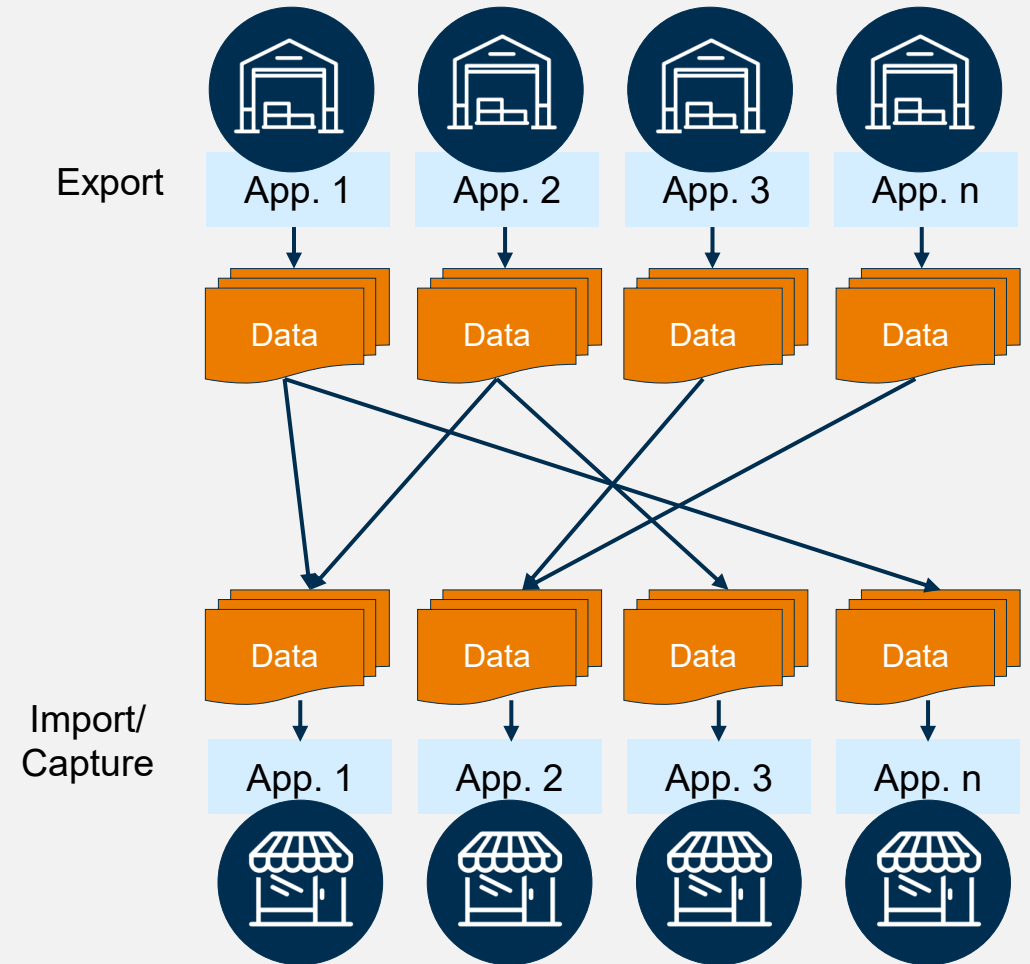
Data spaces and data ecosystems

Standards, security and sovereignty for data exchange

Current situation in the provision and use of data!

- High maintenance effort on both sides
- Up-to-dateness of the information
- Often proprietary and non-standardized
- Many different partners with different requirements
- Severe restriction due to the delimitation of different subject areas
- Redundancy and lack of synchronization
- Mostly no bidirectionality

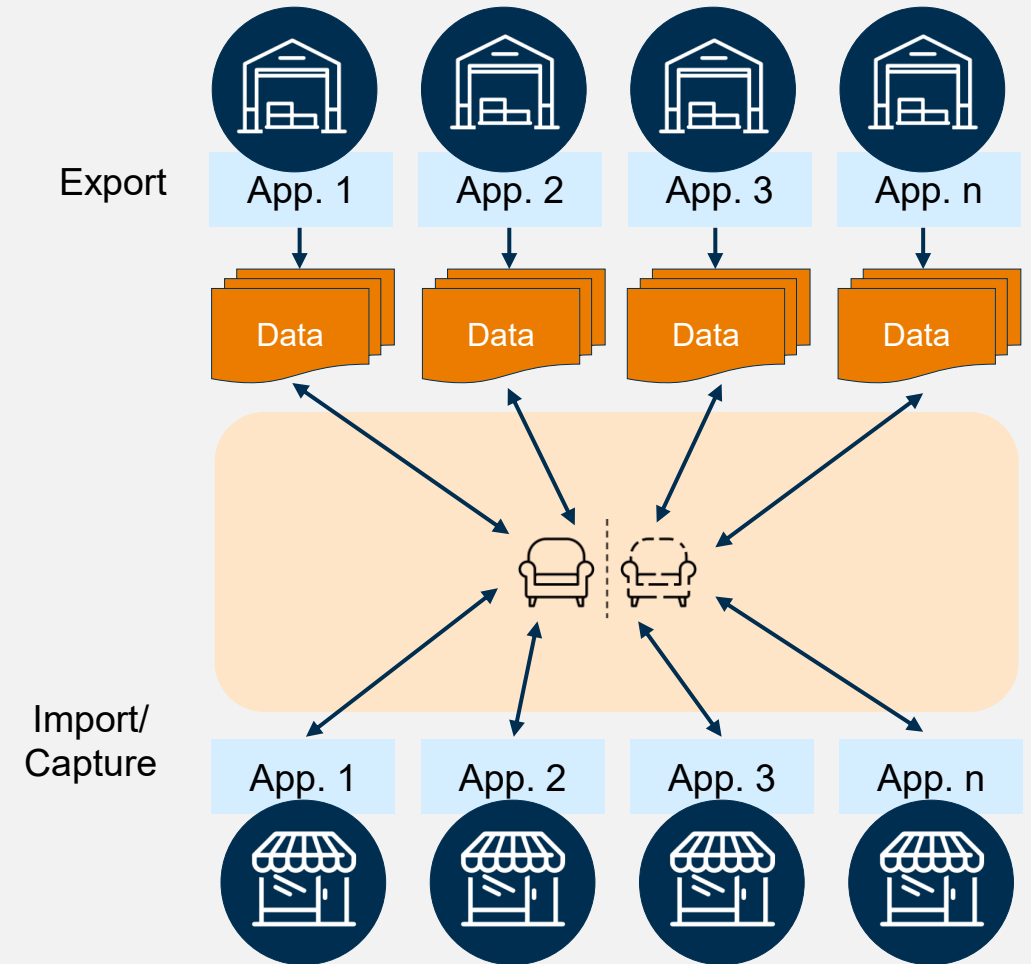
The push procedure...



Digital twins: The game changer for the industry

- Less effort on both sides
- Good up-to-dateness of the information
- Standardised data and procedures
- Many different partners, but single point of truth
- Different requirements, but consolidated for on-demand access
- Data sovereignty and security are guaranteed
- Bidirectional – Basis for the product life cycle

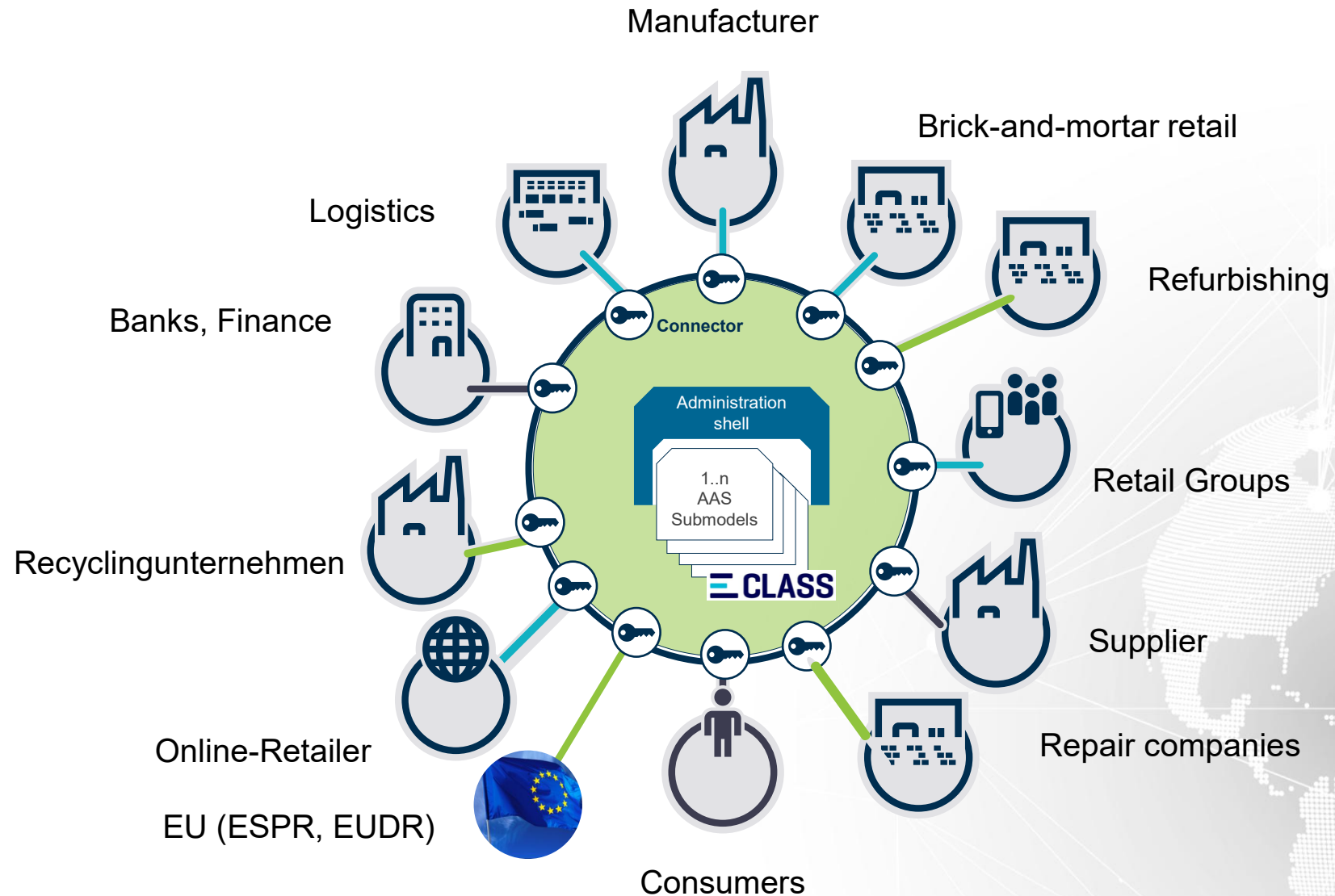
...to the pull process.





"Pull must replace Push!"

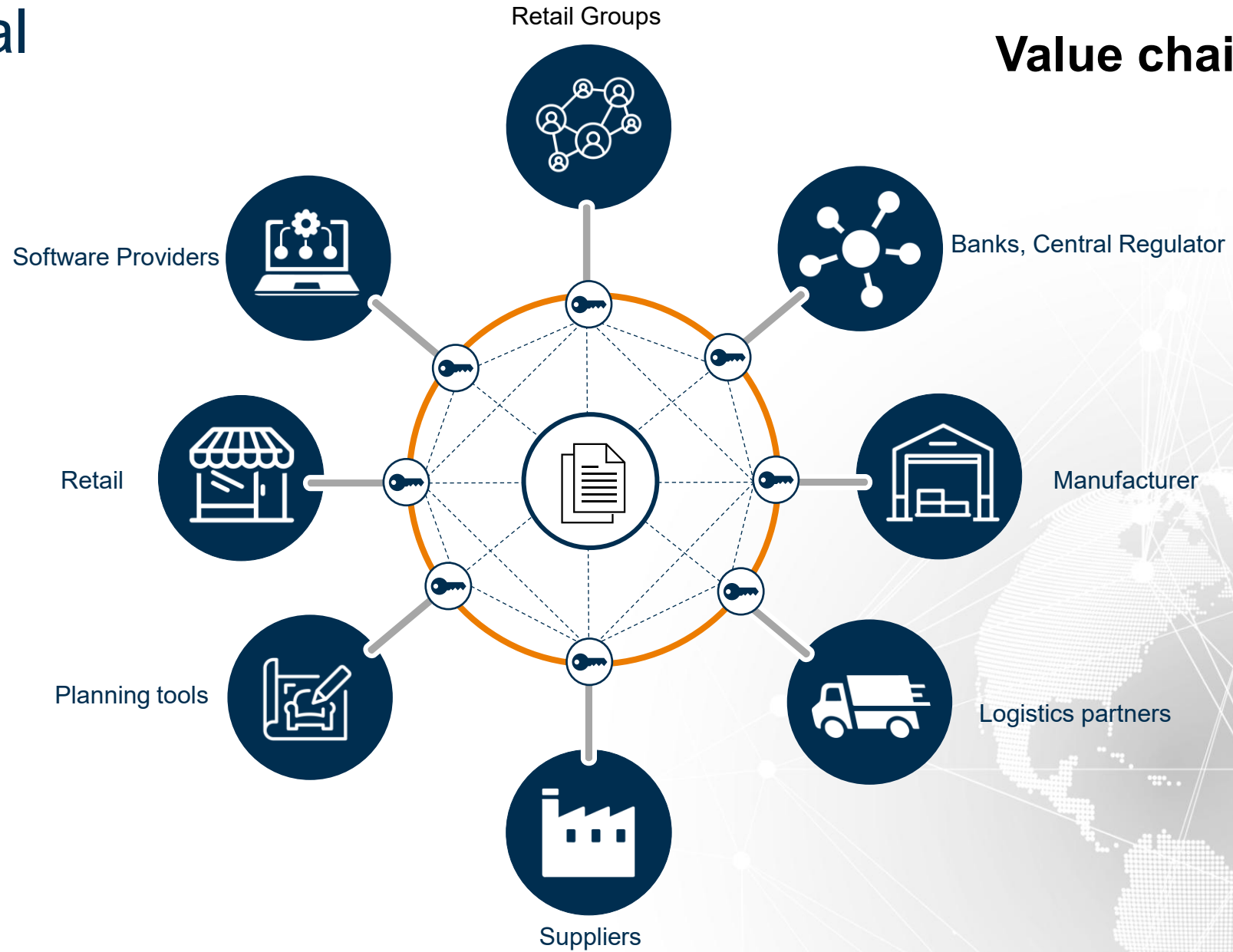
Data spaces and data ecosystems in the furniture industry



Traditional



Value chain



Transformation!

Value Creation Network



Recycling companies

Remanufacturing /
Refurbishing

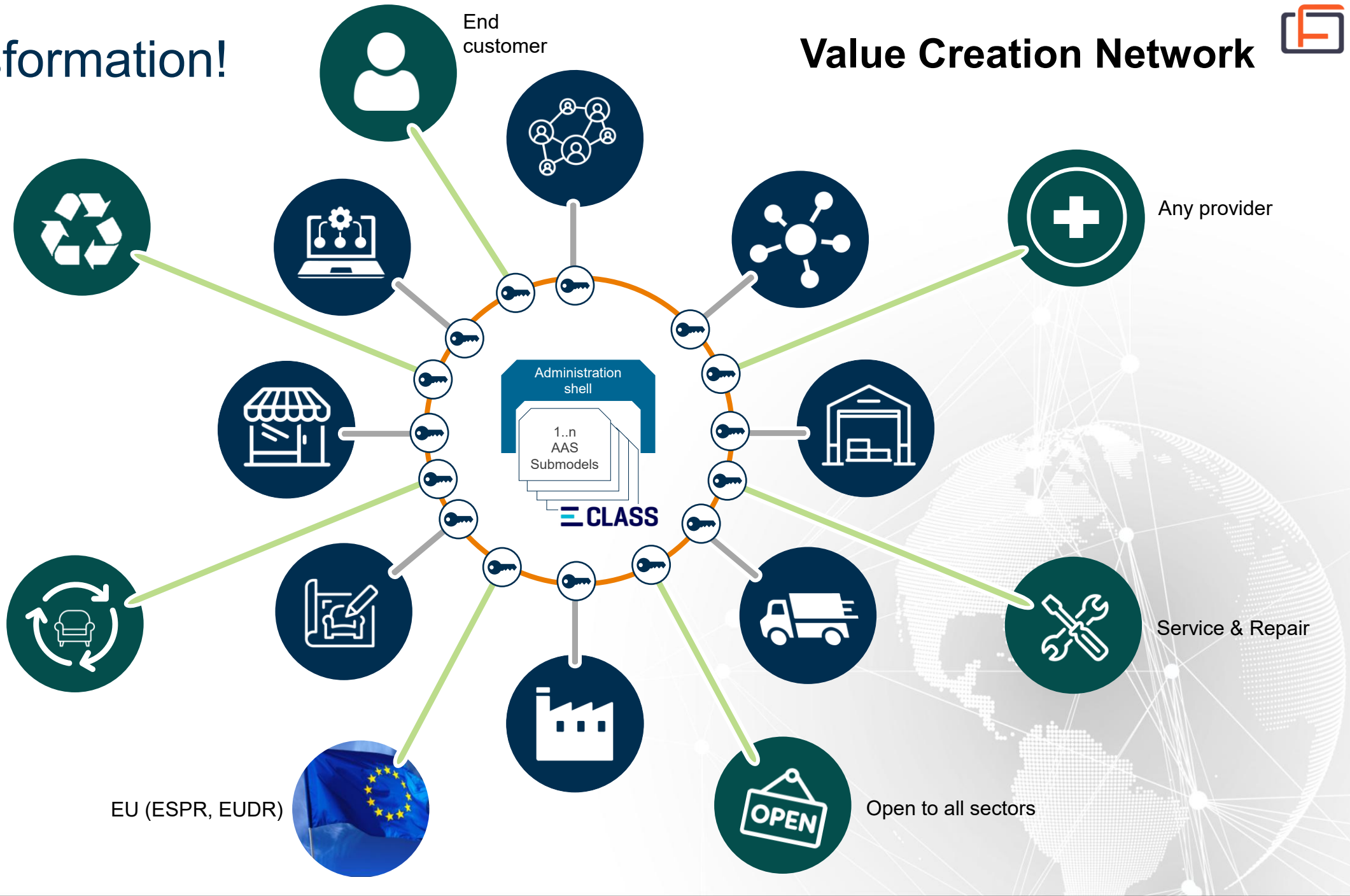
EU (ESPR, EUDR)

End
customer

Any provider

Service & Repair

Open to all sectors





*"The game changer:
The digital twin and the DPP as a single
point of truth in an open Data Space!"*

"Without open, standardized data ecosystems and cooperation on equal terms among all parties involved, the medium-sized furniture industry will not be able to meet the vital requirements of data-driven work in a supply network and will face major problems strategically and economically."

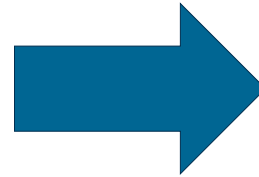
Klaus Bröhl

*Founder & Managing Director Integrated Worlds GmbH
& Initiator Furniture-X*

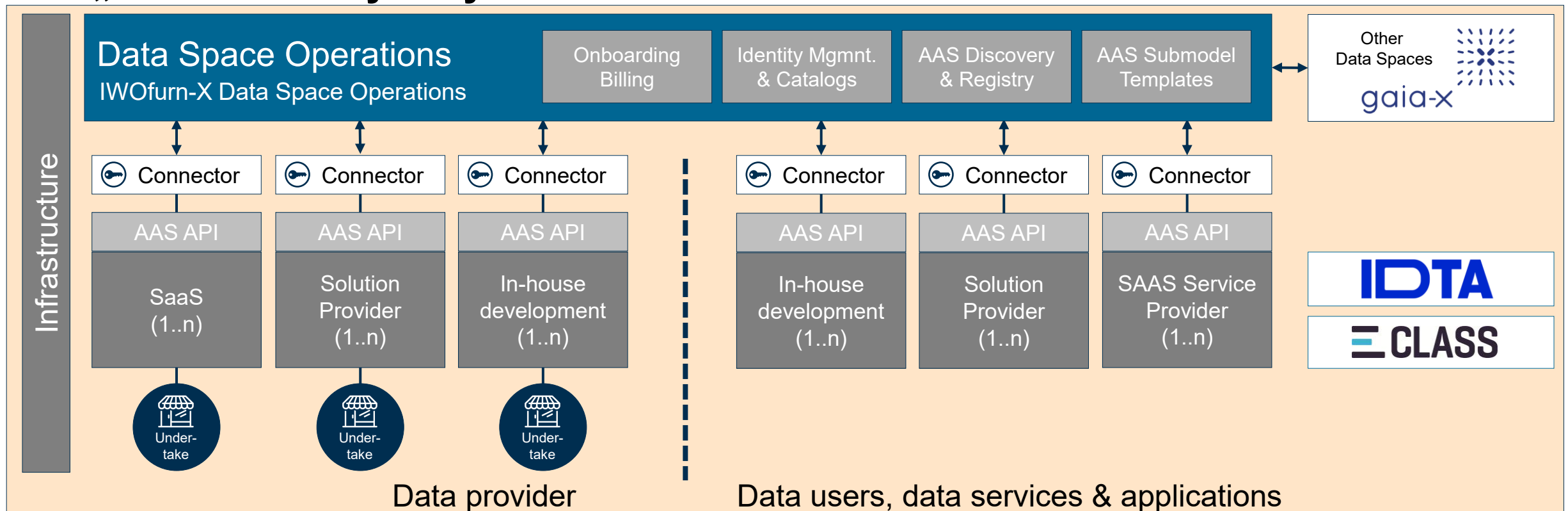
The technical infrastructure of the Data Space

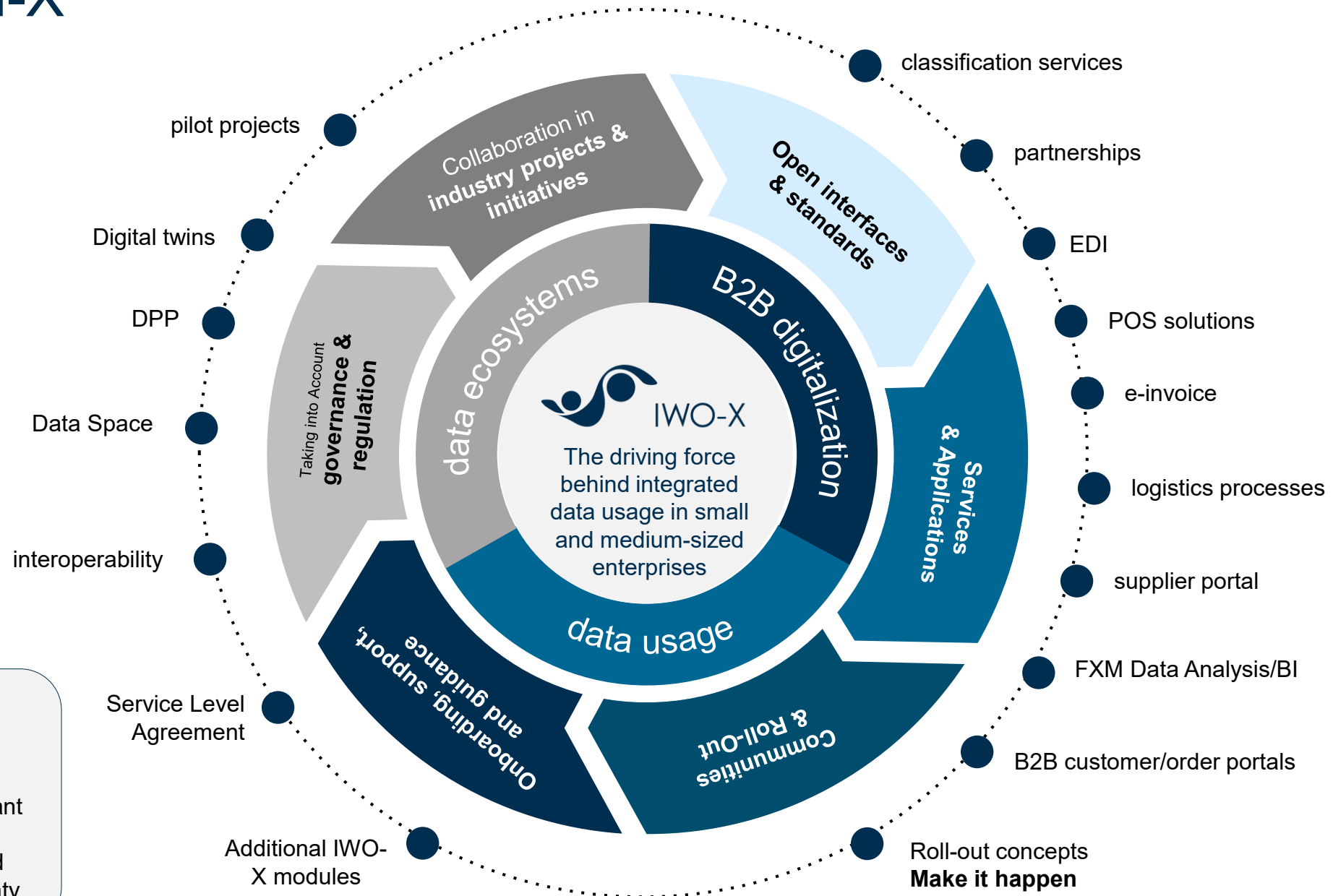


Fraunhofer-Institut für Experimentelles Software Engineering IESE



„AAS for Everybody“





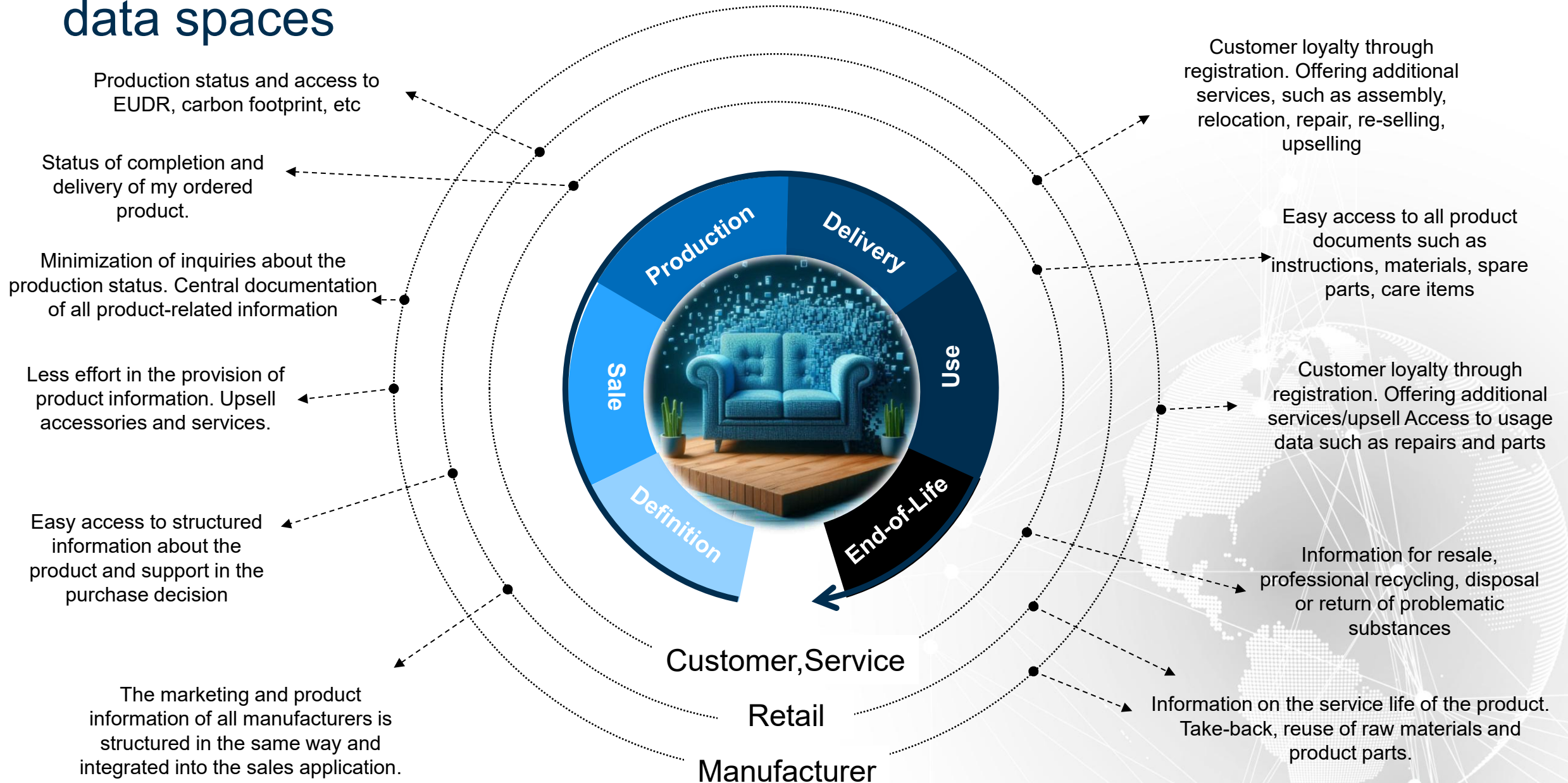
Legally compliant
Compatible
Decentralized
Data sovereignty



Furniture-X

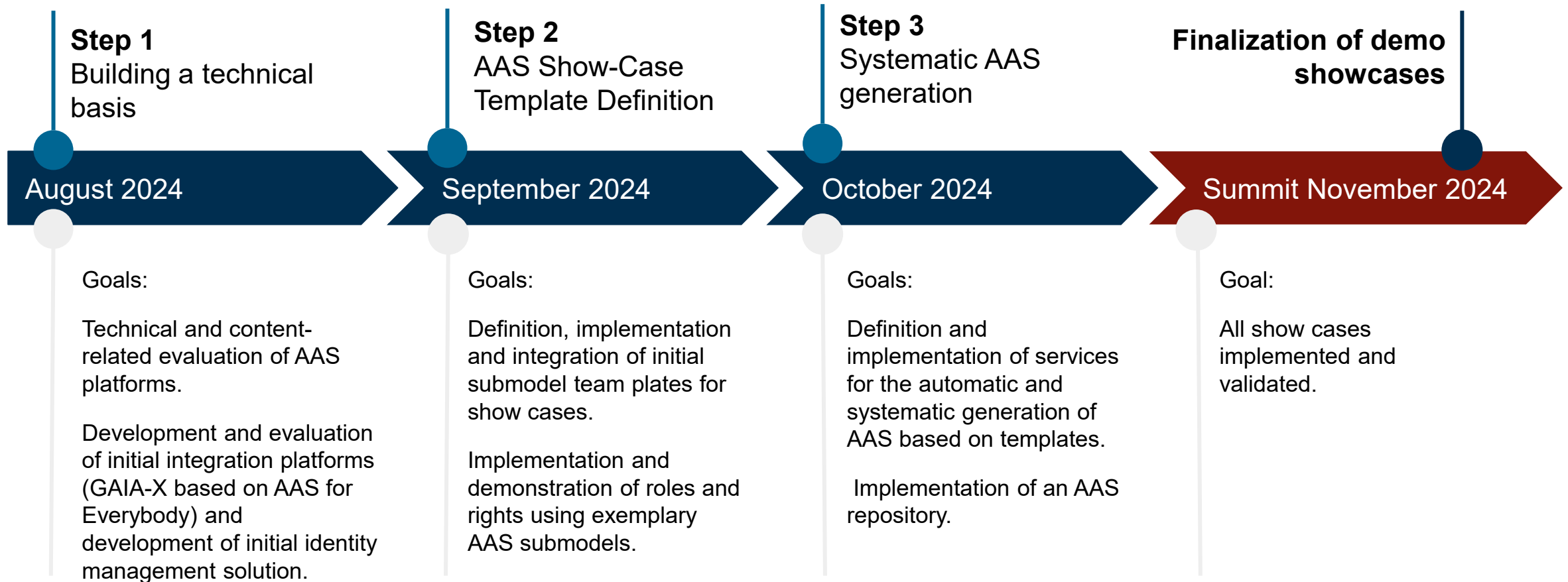
Concrete milestones of
the initiative's work
since Februar 2024

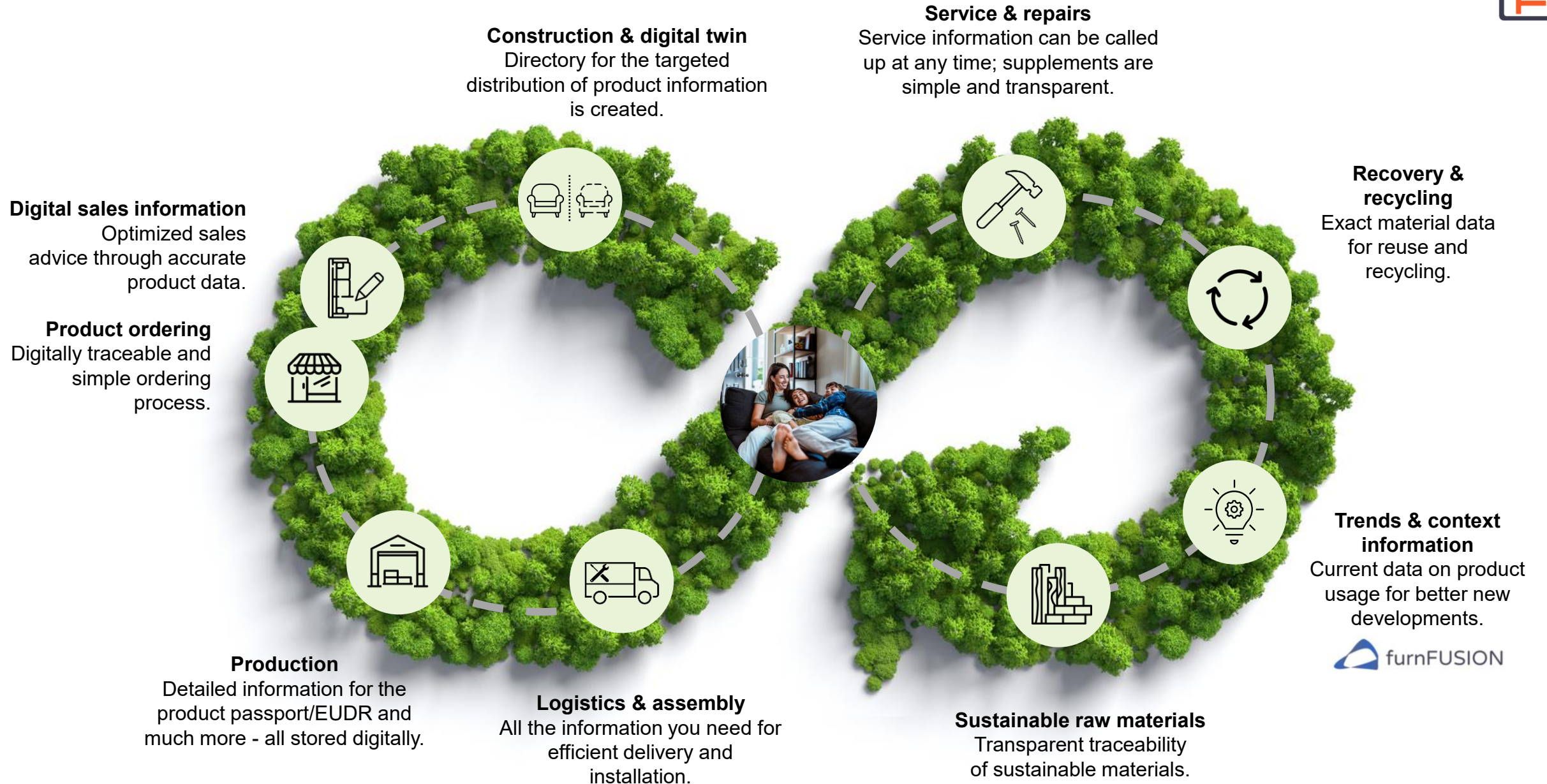
Potentials vs. Regulation ! The use of the digital twins and data spaces



Furniture-X

Technical POC & Demonstrator (Milestone 1)





The demonstrator for a DPP from e.g. Polipol



2 - Structure of the Expert Council

Der digitale Zwilling in der Praxis:
Vorstellung & Demo der Showcases Polipol & Nolte

POLIPOL **nolte**
KREISLAUFWIRTSCHAFT

morphe **data competence center e.V.** **Integrated Worlds**

furnFUSION

Service & Reparaturen
Serviceinformationen jederzeit abrufbar. Nachtragungen einfach & transparent möglich.

Verwertung & Recycling
Enables Materialien für Wiederverwertung und Recycling.

Trends & Kontextinformationen
Aktuelle Daten zur Produktnutzung für bessere Neuentwicklungen.

Produktion
Detaillierte Informationen für den Produktpass EUOR e.v.m. alles digital gespeichert.

Logistik & Montage
Alle Informationen für eine effiziente Lieferung und Montage.

Nachhaltige Rohstoffe
Transparenter Nachweispfad von nachhaltigen Materialien.

Konstruktion & digitaler Zwilling
Verzeichnis für die zielgerichtete Verlebung von Produktinfos einsehbar.

Digitale Verkaufsinfos
Optimierte Verkaufsbereitstellung durch genaue Produktdaten.

Produktbestellung
Bestellprozess digital nachvollziehbar und einfach.

It's not an EU story - Ein erster Datenraum für die kreislauffähige Möbelwirtschaft

Regeln

European Union
ESPR – European Sustainable Product Regulation / EUOR – European Deforestation Regulation (?)

Furniture-X (?)
Koordiniert „Furniture“ Data Spaces

IWO furn-X Data Space Operations

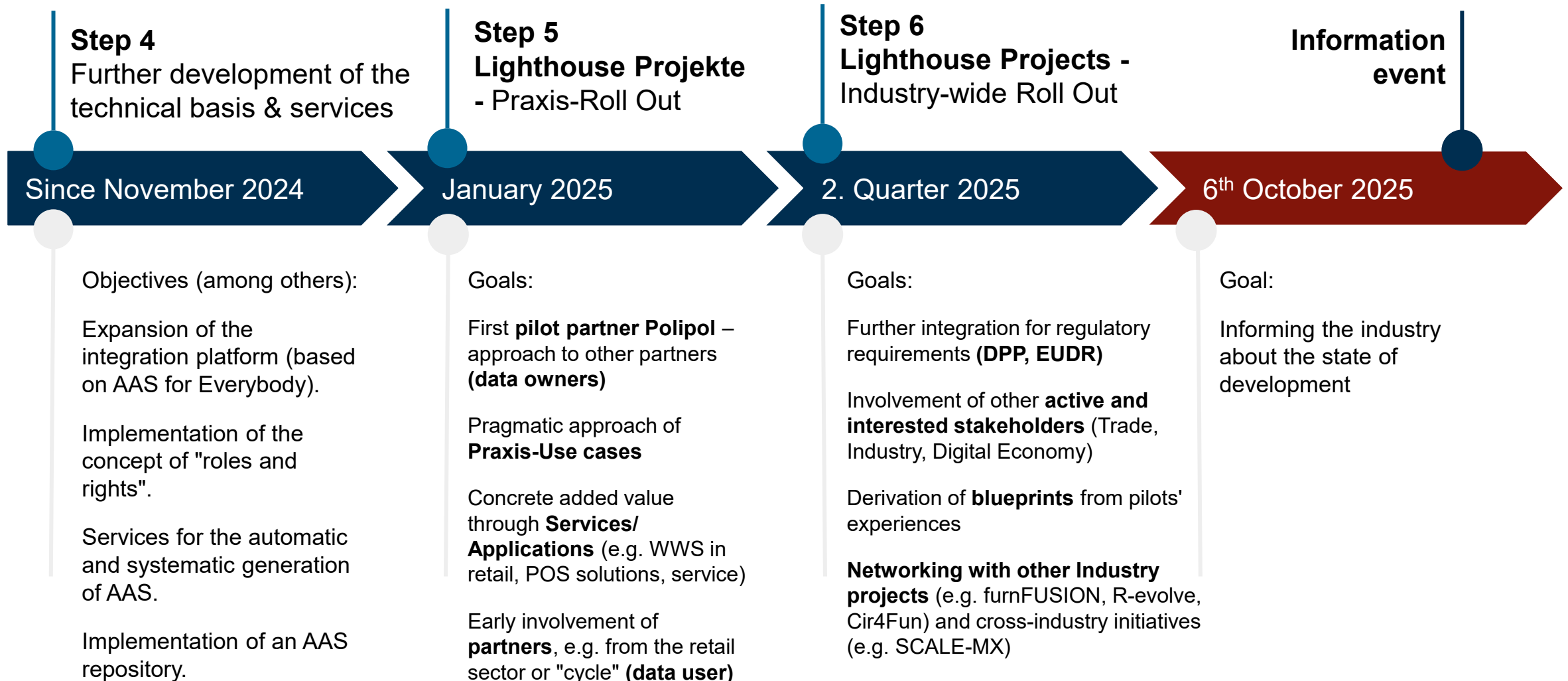
Datenbereitsteller

Datennutzer, Datenservices & Anwendungen

The DPP is a "by-product"

Furniture-X

First attempt at a roadmap for an introduction (Milestone 2)





Lighthouse projects I

From quick wins to complex solution modules

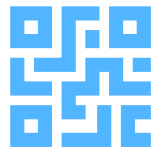
“Think big – start small”



Overview of Lighthouse Projects – Milestone 2

1

Nameplate &
Product-
information



2

Bill of
materials
(BOM)



3

Complex
orders



4

Integration
of Recycler



5

Classification
of data



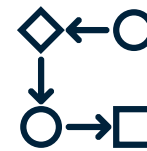
6

Company
data



7

EDI-
Integration



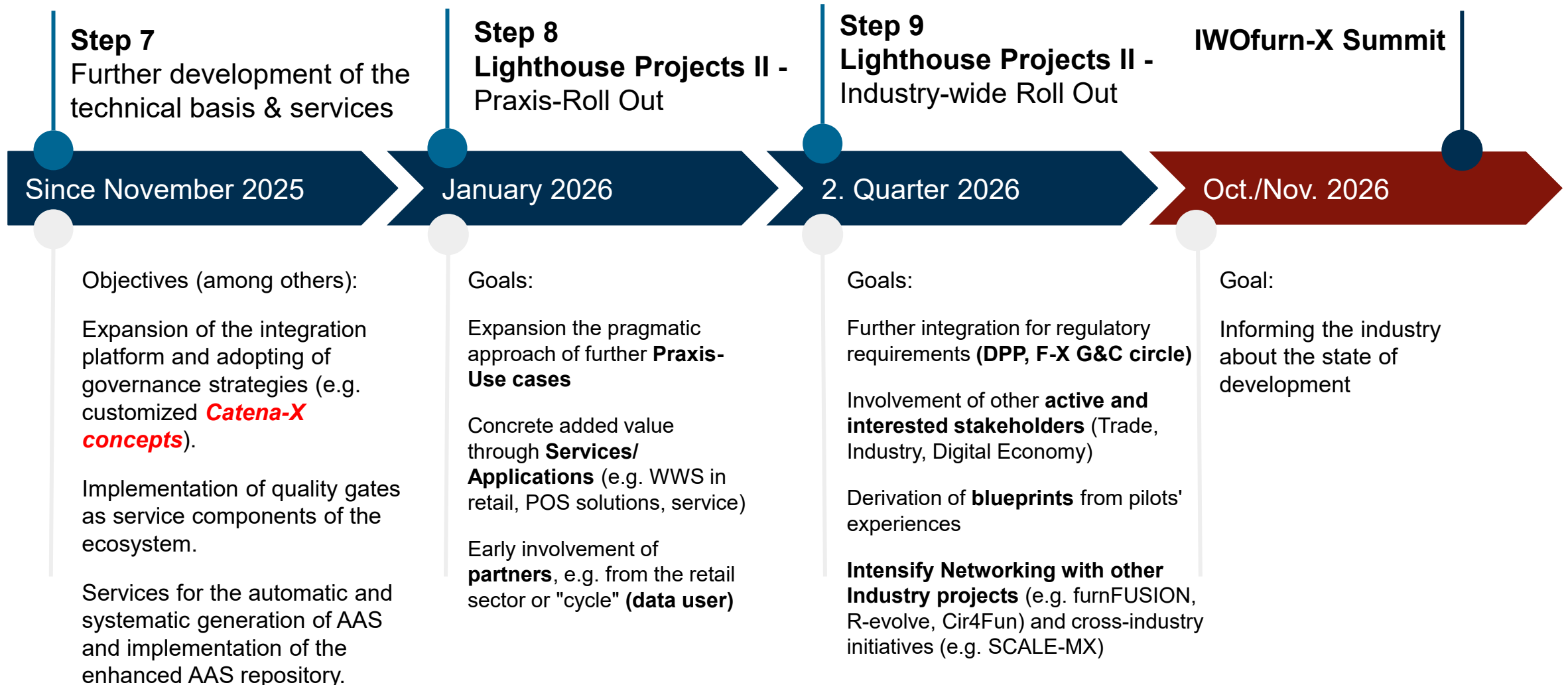
8

Enrichment
from catalog
data



Furniture-X

A reliable roadmap for implementation roadmap (Milestone 3)





Lighthouse projects II

Lessons learned, restart but still
“Think big – start small”



Overview of Lighthouse & Evaluation Projects

Lighthouse Projects

Collaboration to implement a precise use case

Result: blueprints, interfaces to systems,...

1

Nameplate &
Product
Information



2

Bill of
materials
(BOM)



3

Complex
orders



4

Company
Data Twin



5

Transaction
Twin (new)



Integration Projects

Gain insights in a defined area

Result: Piloting, feasibility assessment, ...

1

Classification
of data



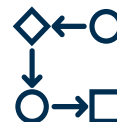
2

Enrichment
from catalog
data



3

EDI-Integration



4

Dynamic
Carbon-
Footprint



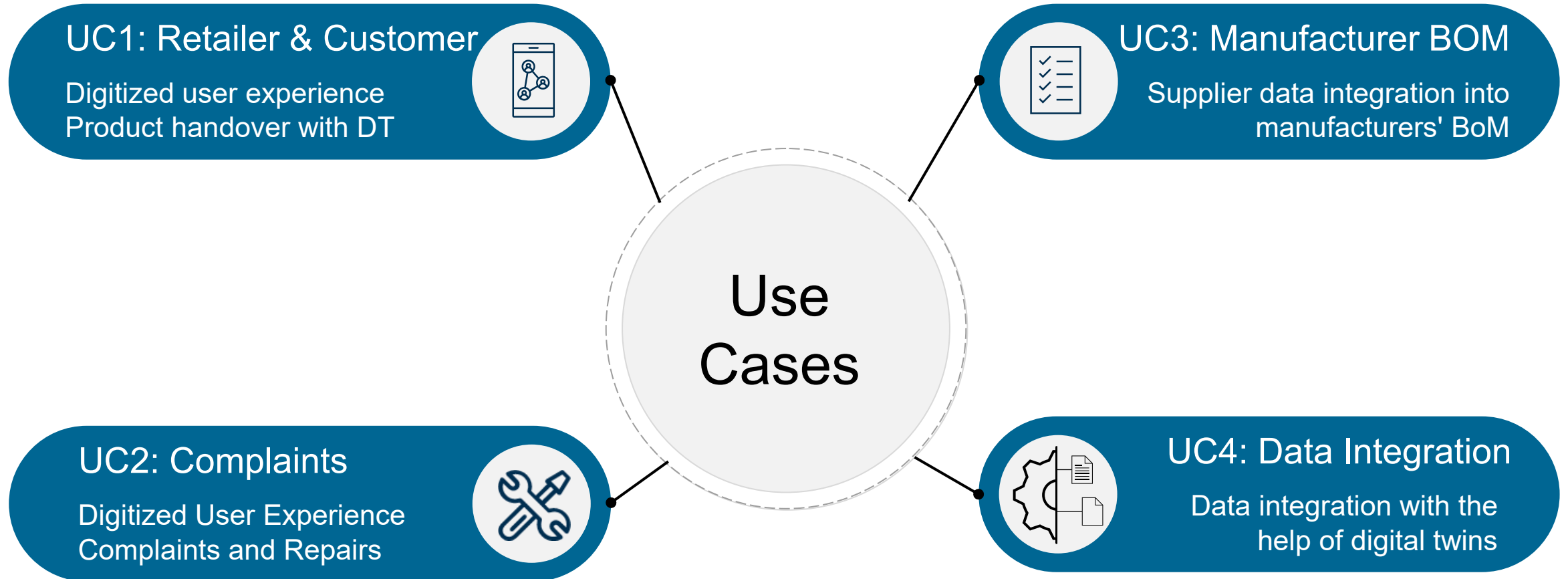
5

Integration
of Recycler





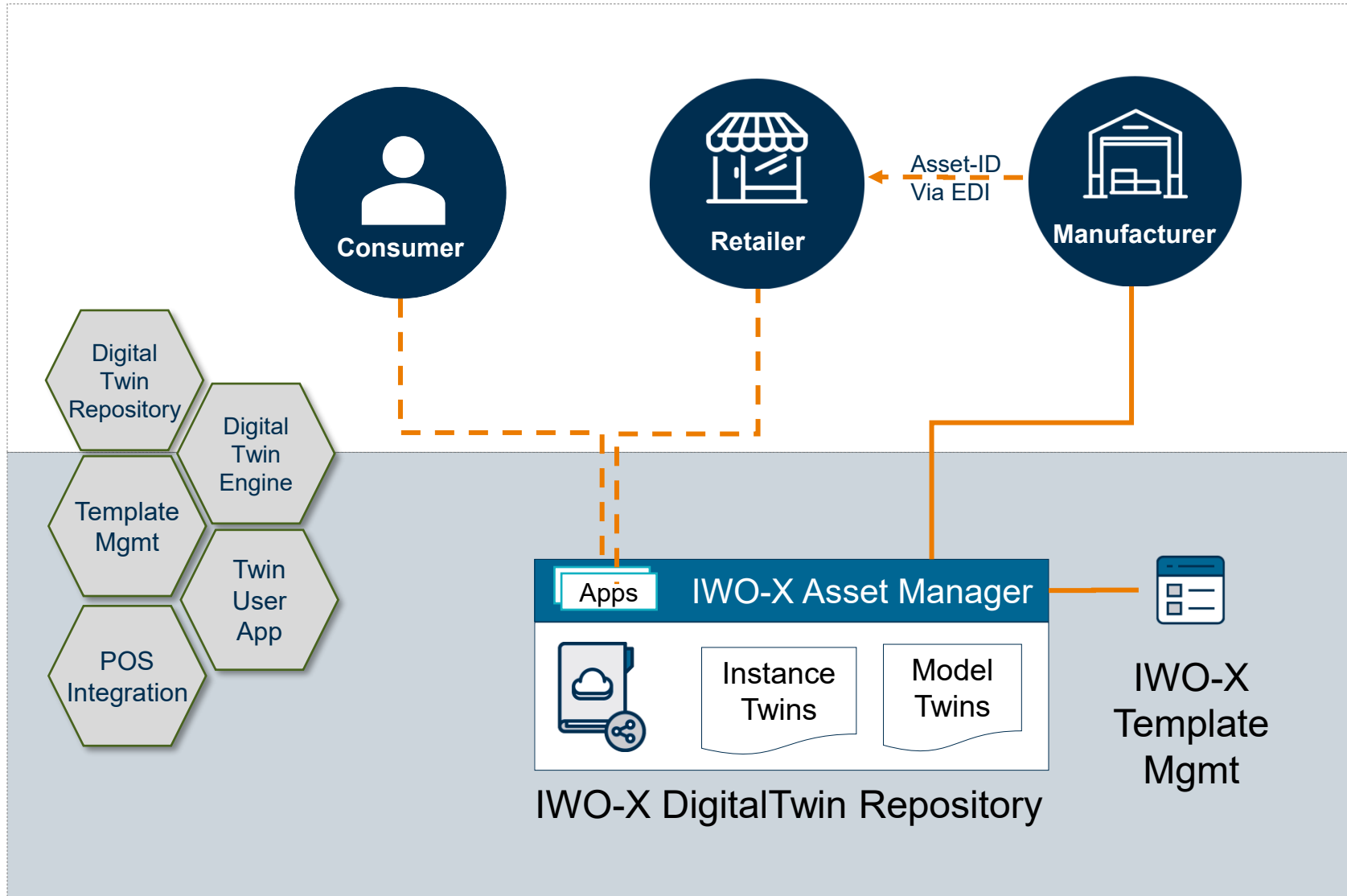
Predefined Use Cases





UC1: Digital twins for retail and end customers

Digital product solutions for POS and end customers



UC Content

- + Digital Twin Content:
 - Product Information
 - Handover documents
 - Certificates
- + Optional:
 - App skinning
 - Additional content



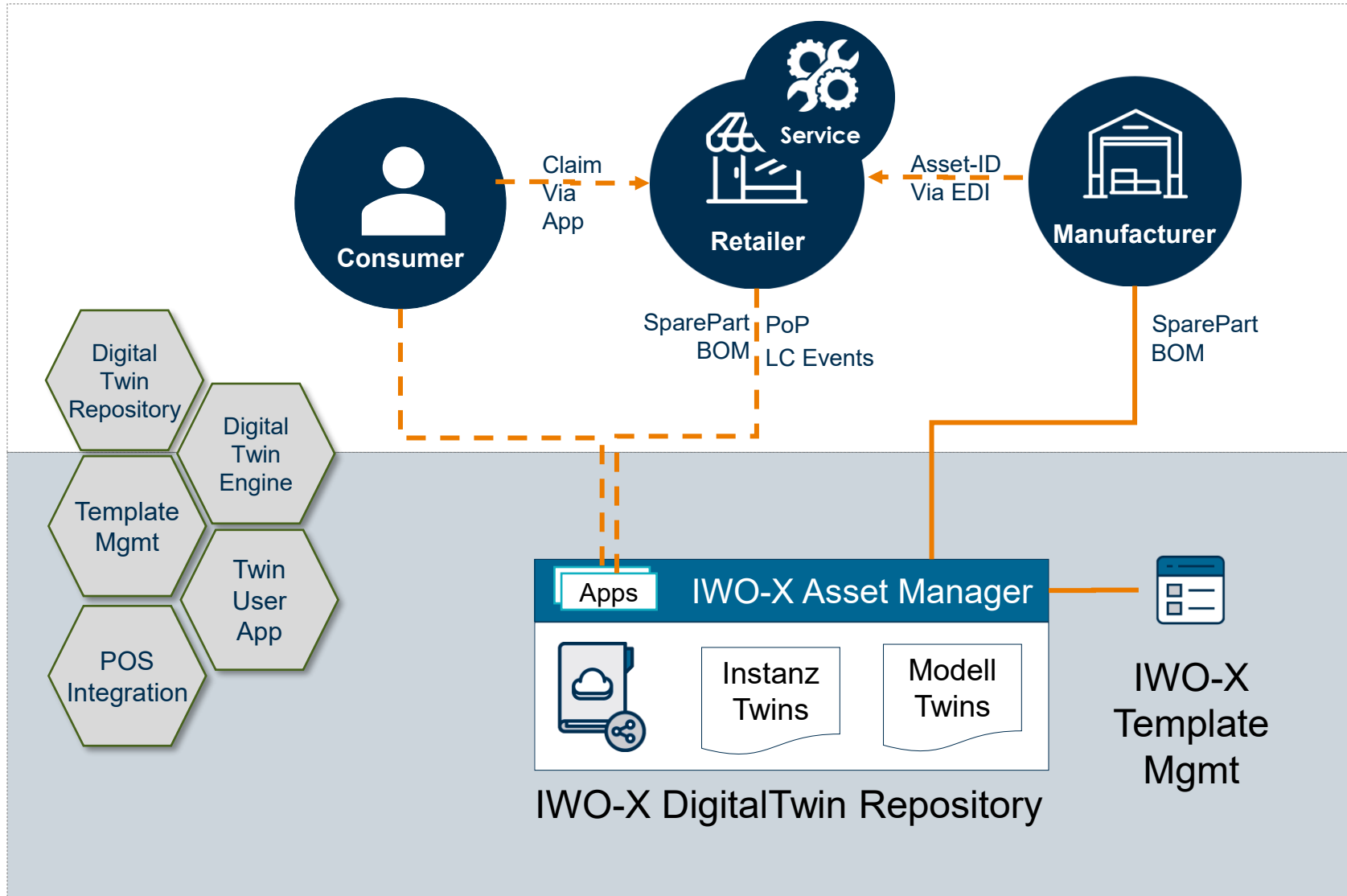
UC Benefits

- + Digital customer engagement
- + Digitization of product documentation
- + Connection of order and assets



UC2: Complaints and repairs

User experience complaints and repairs



UC Content

- + Digital Twin Content:
 - Product Information
 - SparePart-BOM
 - PoP
- + Optional:
 - Complaints via App
 - Pictures of defect+PoP



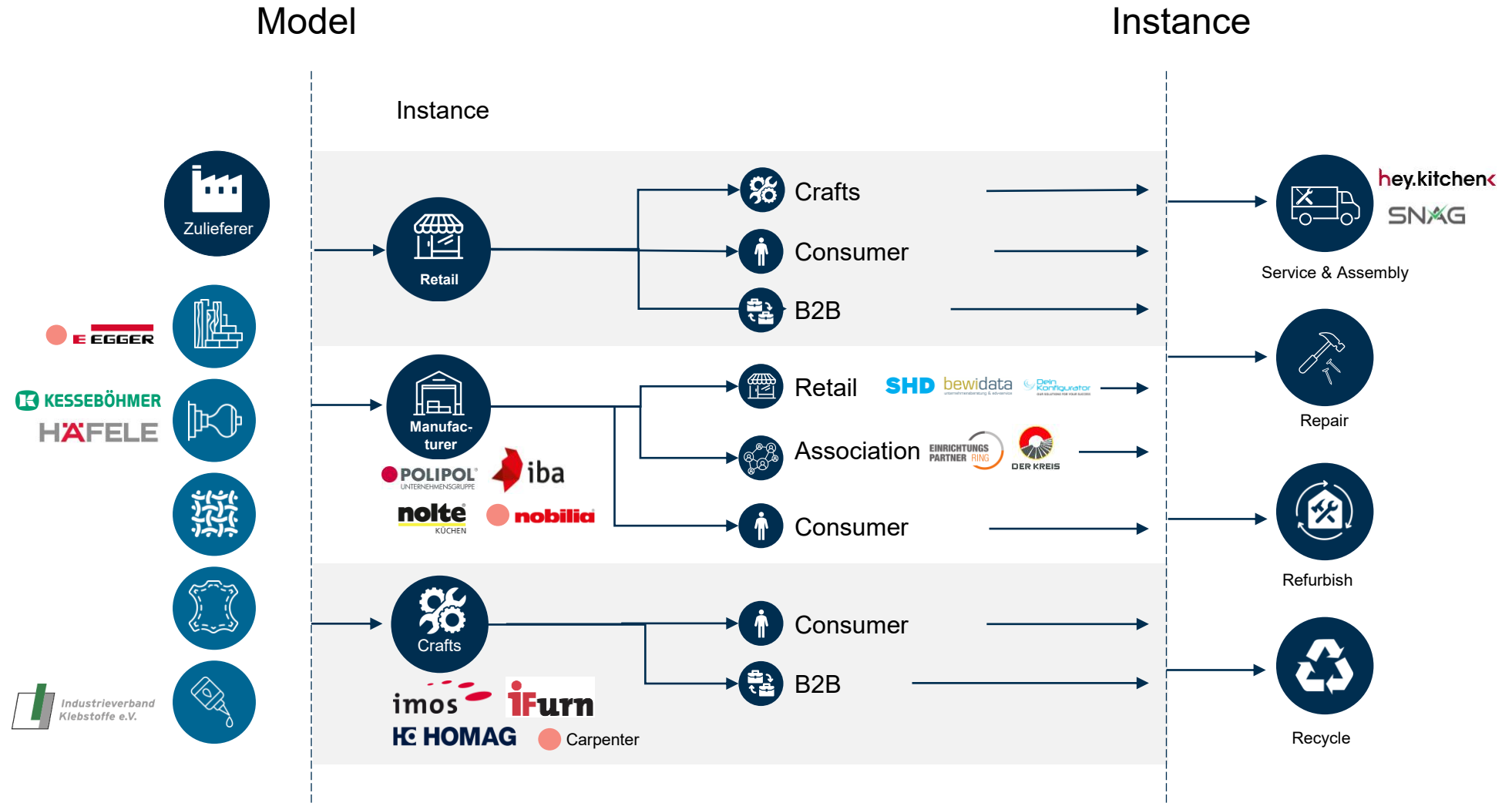
UC Benefits

- + Process efficiency by Data Integration
- + Customer experience in case of repair
- + Access to spare parts
- + Documentation and subsequent evaluations



UC3: Manufacturer BoM

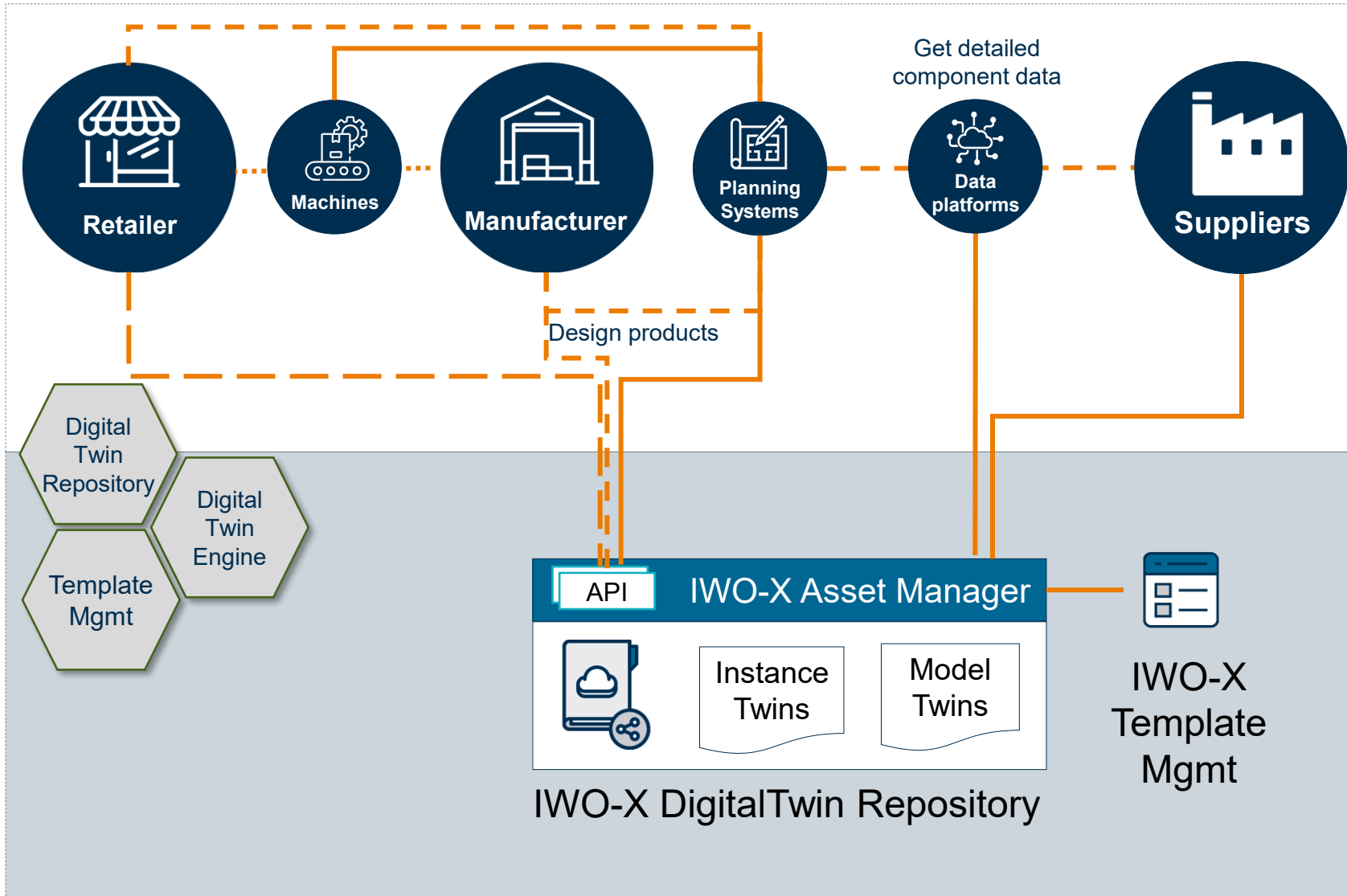
Supplier data integration into manufacturers' BoM





UC3: Manufacturer BoM

Supplier data integration into manufacturers' BoM



UC-IContent

- + Digital Twin Content:
 - Product Information
 - BOM
 - Link to Components
- + Optional:
 - "Depth" of the BOM can be determined

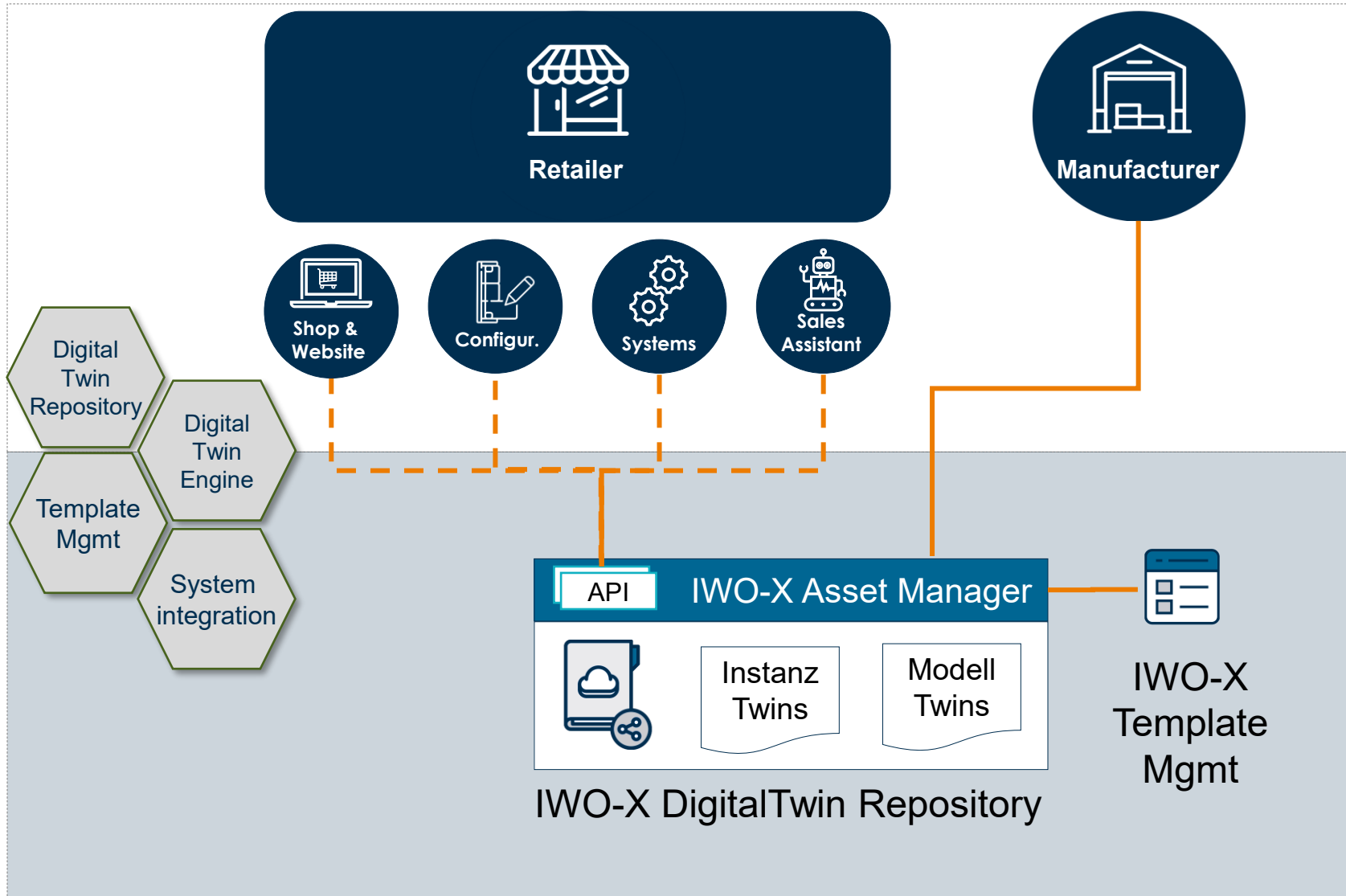


UC Benefits

- + Detailed BoM with integrated data from suppliers (e.g. spare parts)



UC4: Data integration with the help of digital twins



UC Content

- + Digital Twin Content:
 - Product Information
 - Customer documents
 - Certificates
 - Models (+data)
- In general, everything that belongs in the IT systems of retailers



UC Benefits

- + Increase in data quality on the part of the retailer
- + Reduction of effort and automation



Participants (26 / 03.2026)



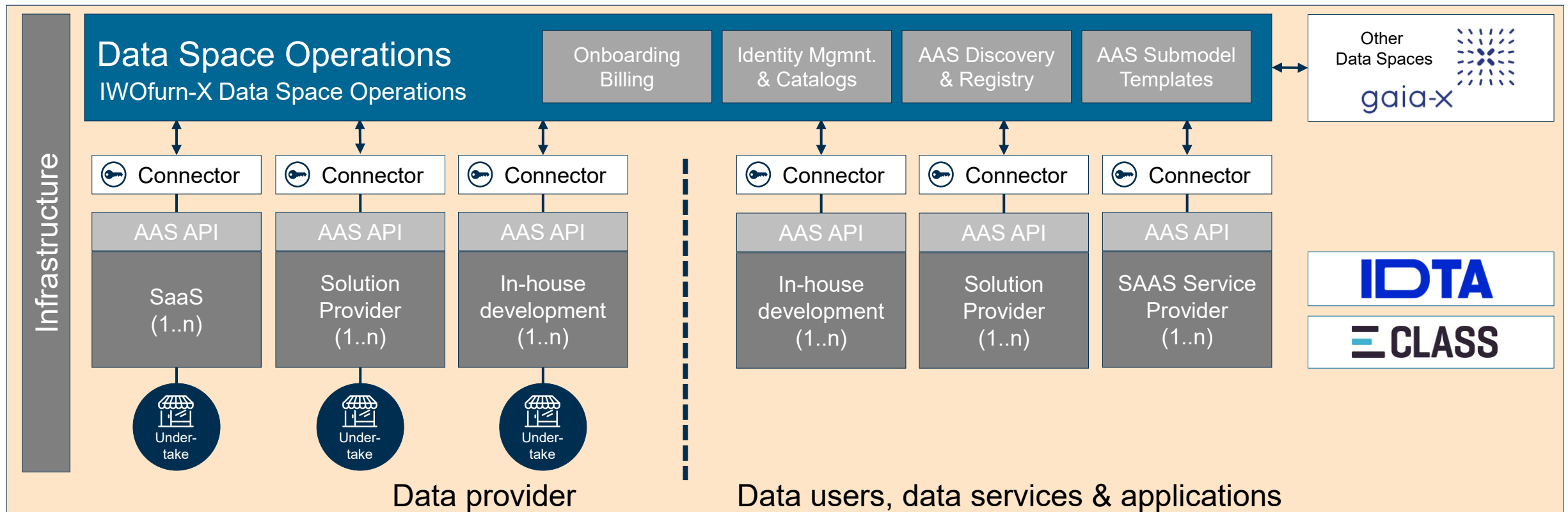


Governance & Compliance and the data ecosystems for a circular furniture economy

The enriched service model of the
IWOofurn-X data ecosystems

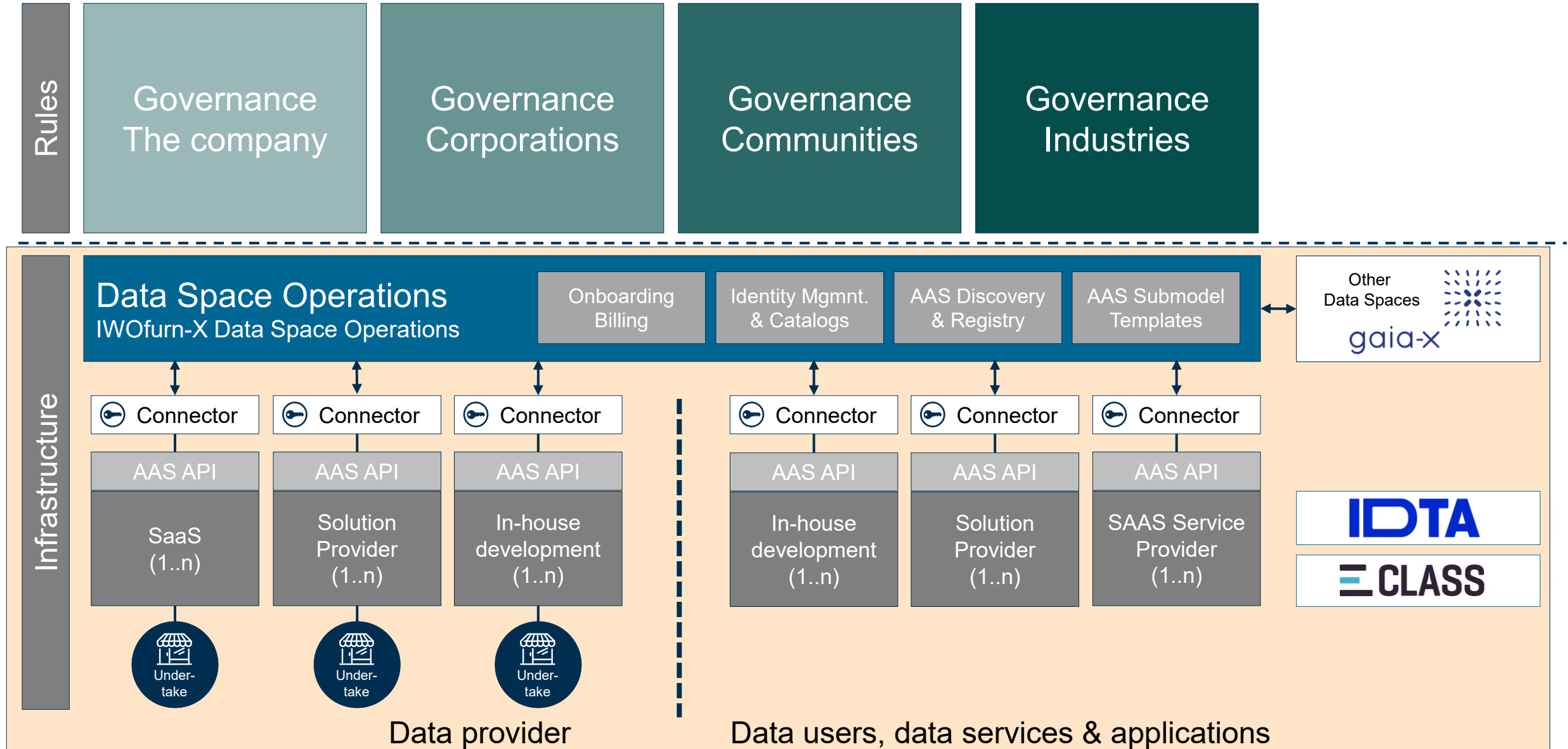


The technical infrastructure of the Data Space



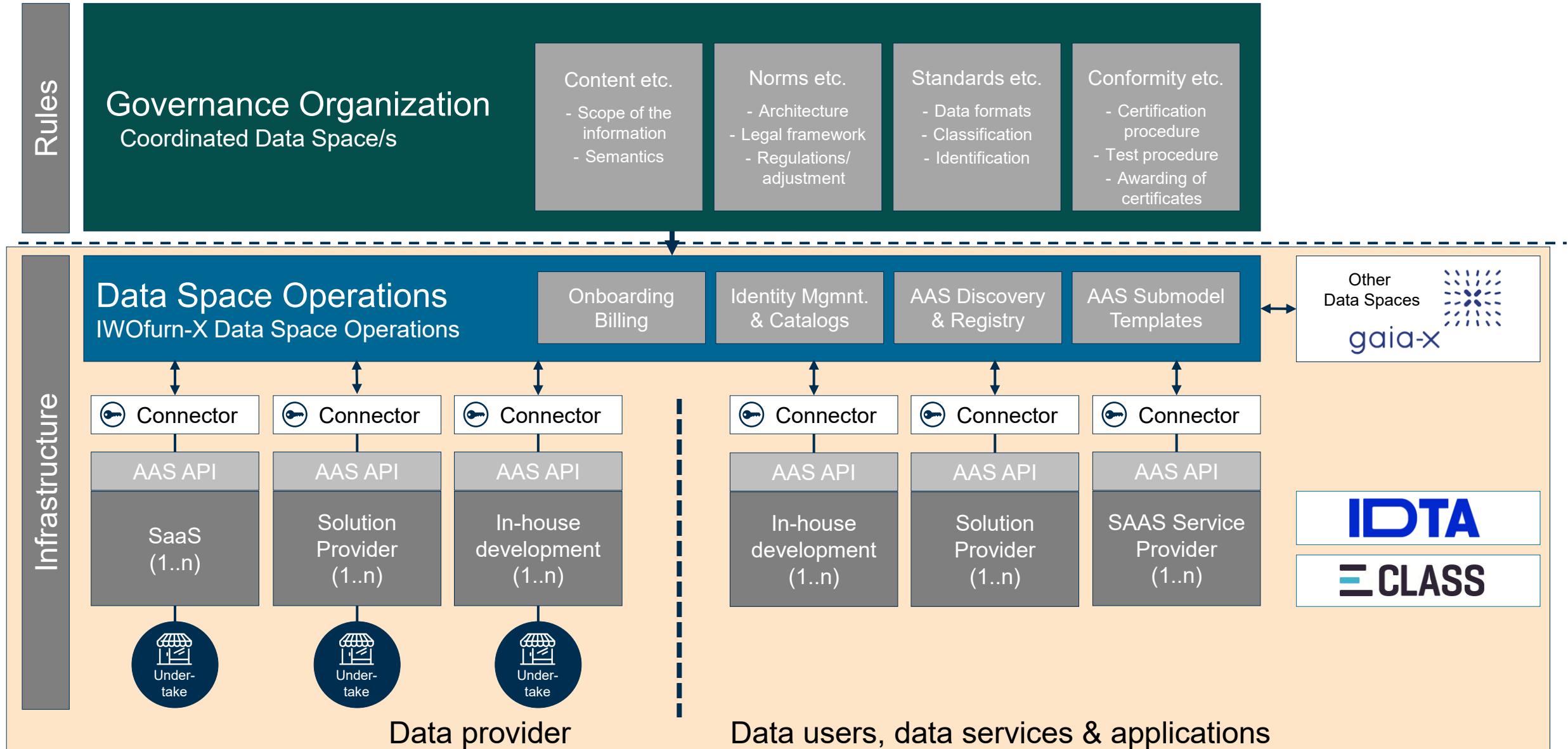


Rules for collaborative working in data spaces



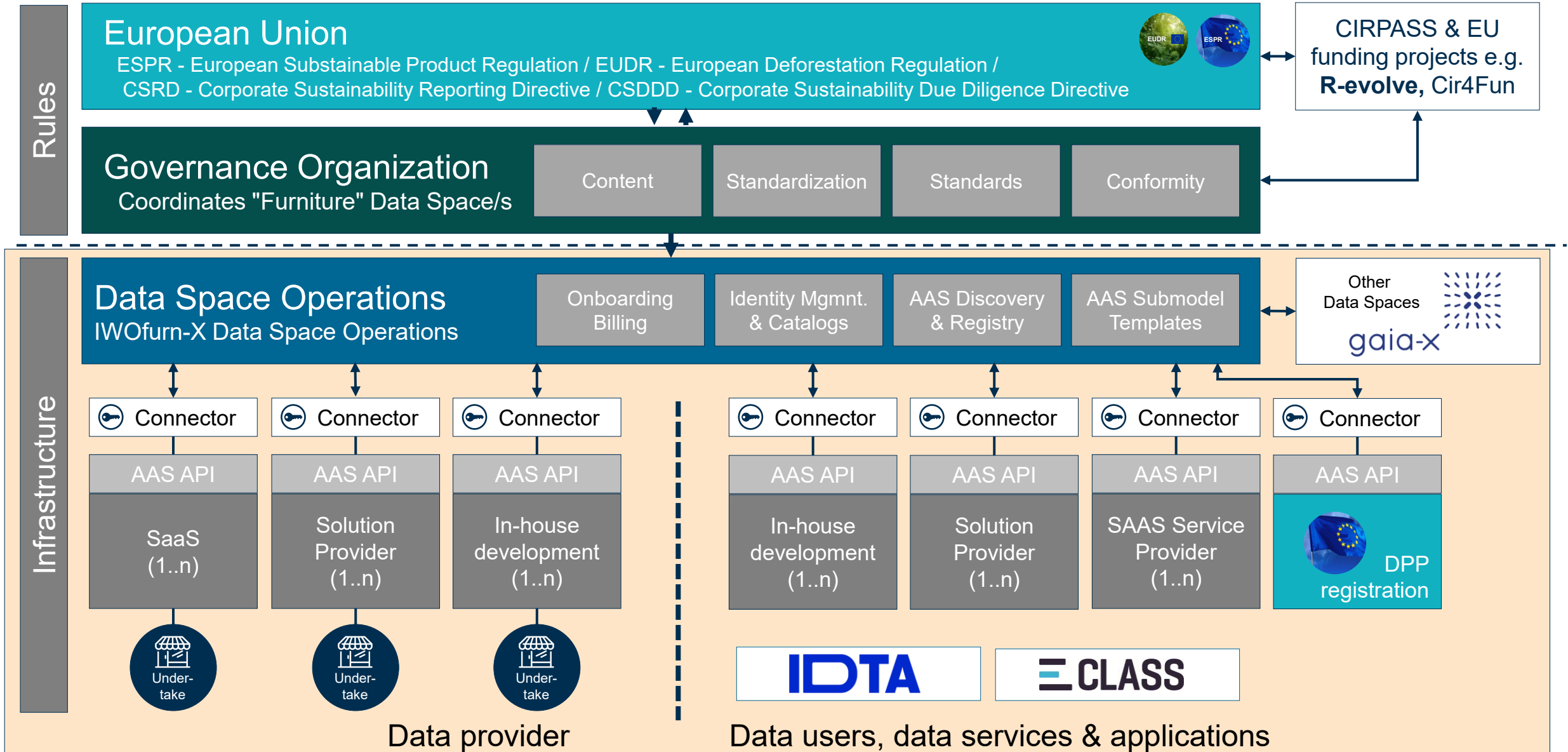


Governance in the environment of data spaces



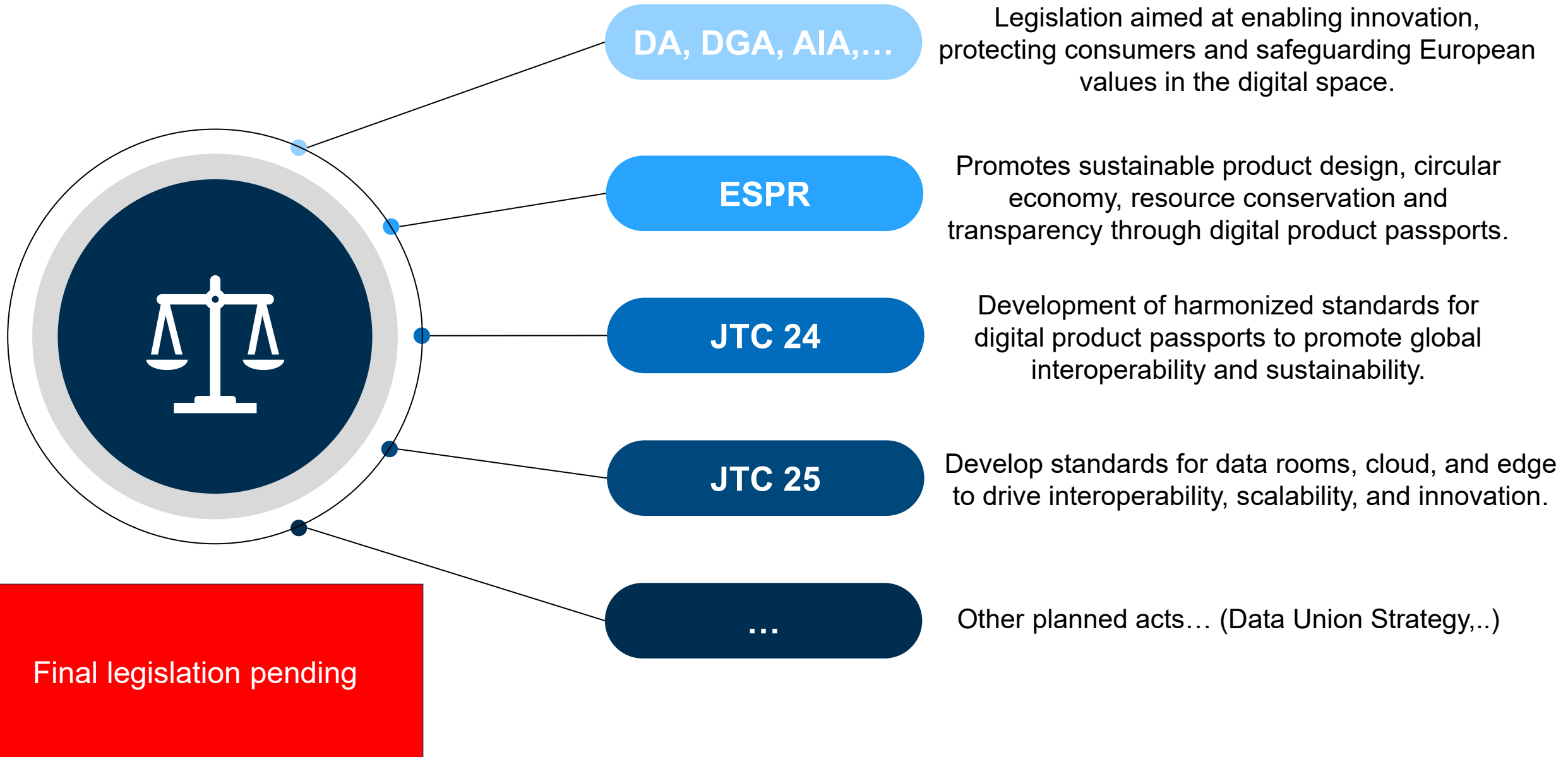


A data space for a circular furniture economy





A data space for a circular furniture economy





R-evolve

The 24 R-evolve project members



Forma 5



AKT™

V/S



CLUSTER FVG
LEGNO ARREDO CASA



**LIFESTYLE
AND DESIGN
CLUSTER**

die möbelindustrie



The contribution of Integrated Worlds to the EU project R-evolve

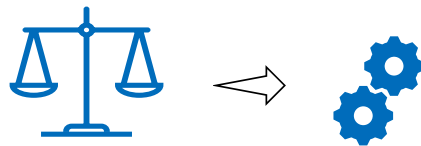


DPP- Governance- Framework



Contributing expertise to the development of DPP governance framework, Feedback on rules/mechanisms, participation in simulation to test different options of the framework

Implementation Governance- Framework



Expansion of the existing technical infrastructure to meet the DPP governance framework, provision of necessary auxiliary materials

Piloting



Carrying out the test phase with various suppliers, determining the need for data (exchange), identifying obstacles/
Potential for improvement in information flows of companies/DPP system

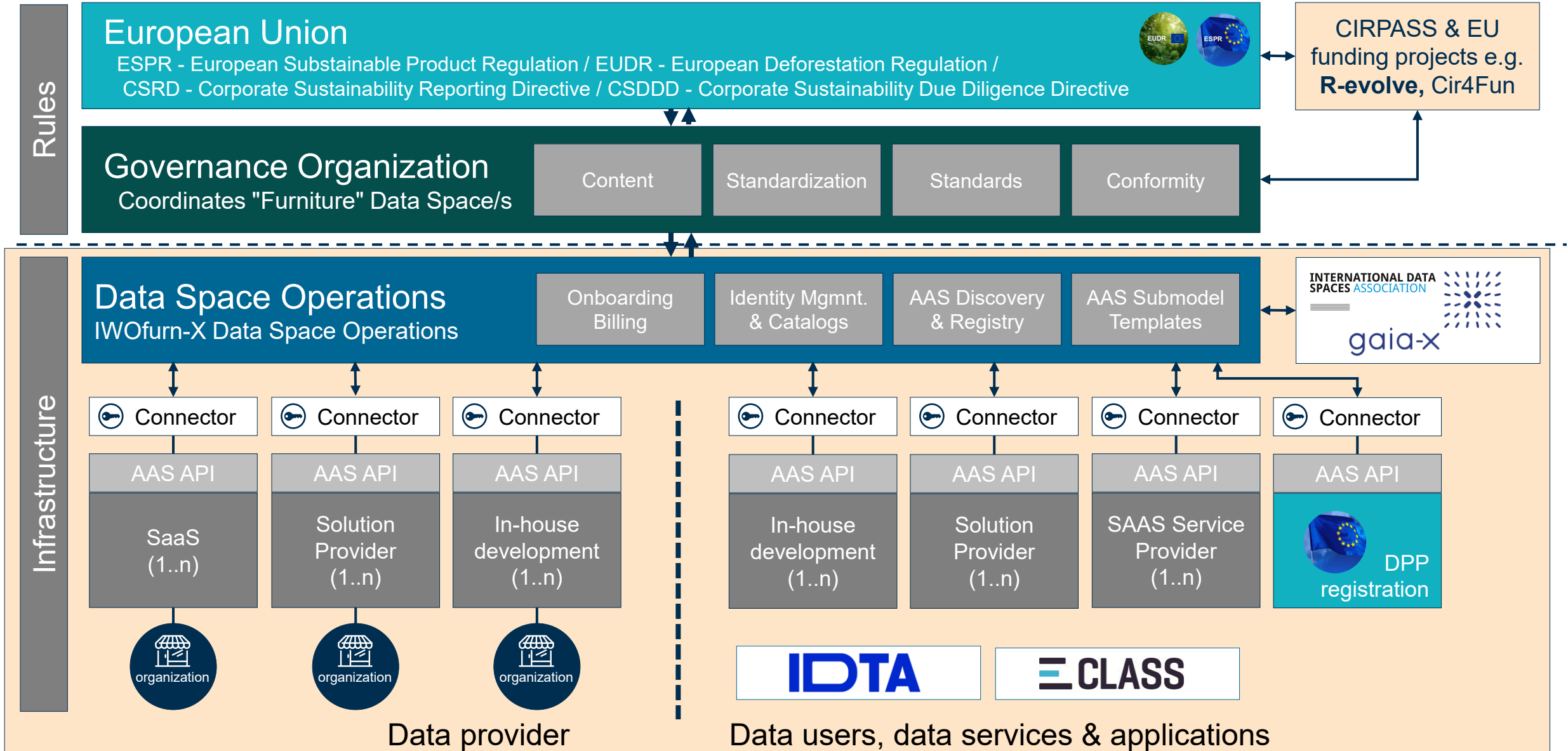
DPP-Lifecycle



Mapping of the complete life cycle of a piece of furniture – from repair to recycling and the "return factory", Collecting and analyzing experiences/opinions from the testing community

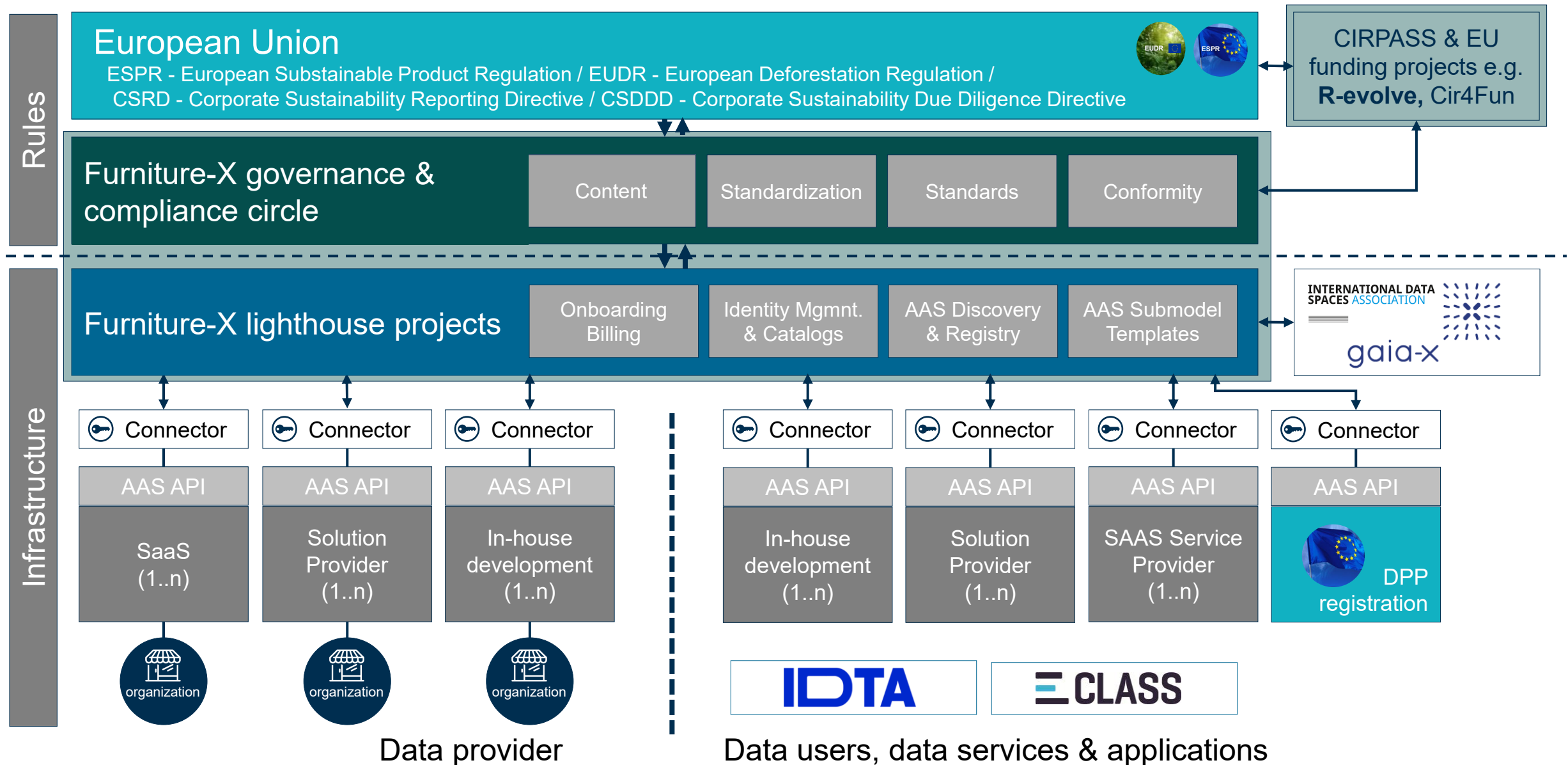


A data ecosystem for a circular furniture economy





Furniture-X governance & compliance circle





Governance - Questions from the use cases

Who regulates access to the information contained therein?

How identifiers are used for products and components?

How identifiers are used in series products and components??

Who is liable if incorrect data has been provided?

Is there a standardized role and rights concept?

Who must register the DPP with the EU?

Who owns the digital twin?

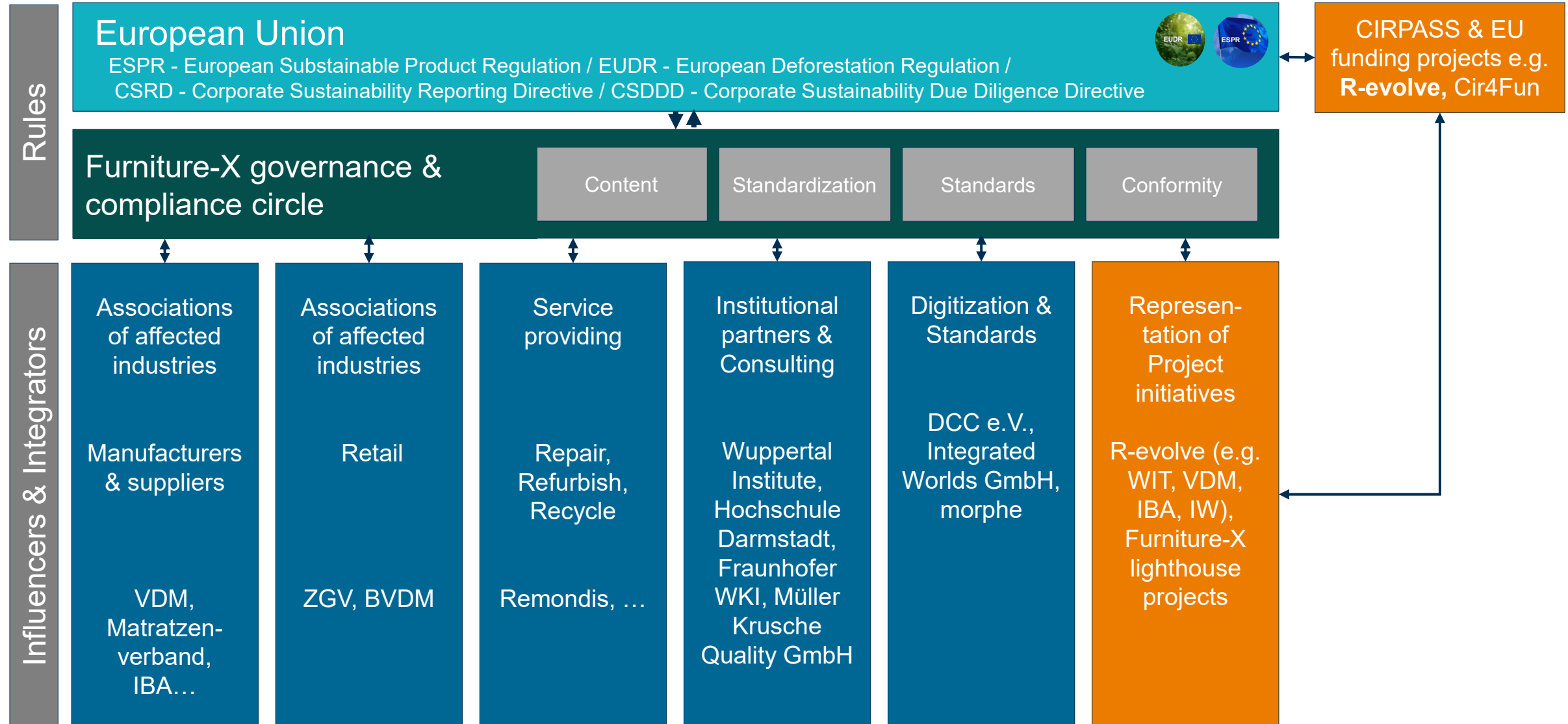
DDP must be created and generated for all products (e.g. entire kitchen)?

Difference between placing on the market and making available?

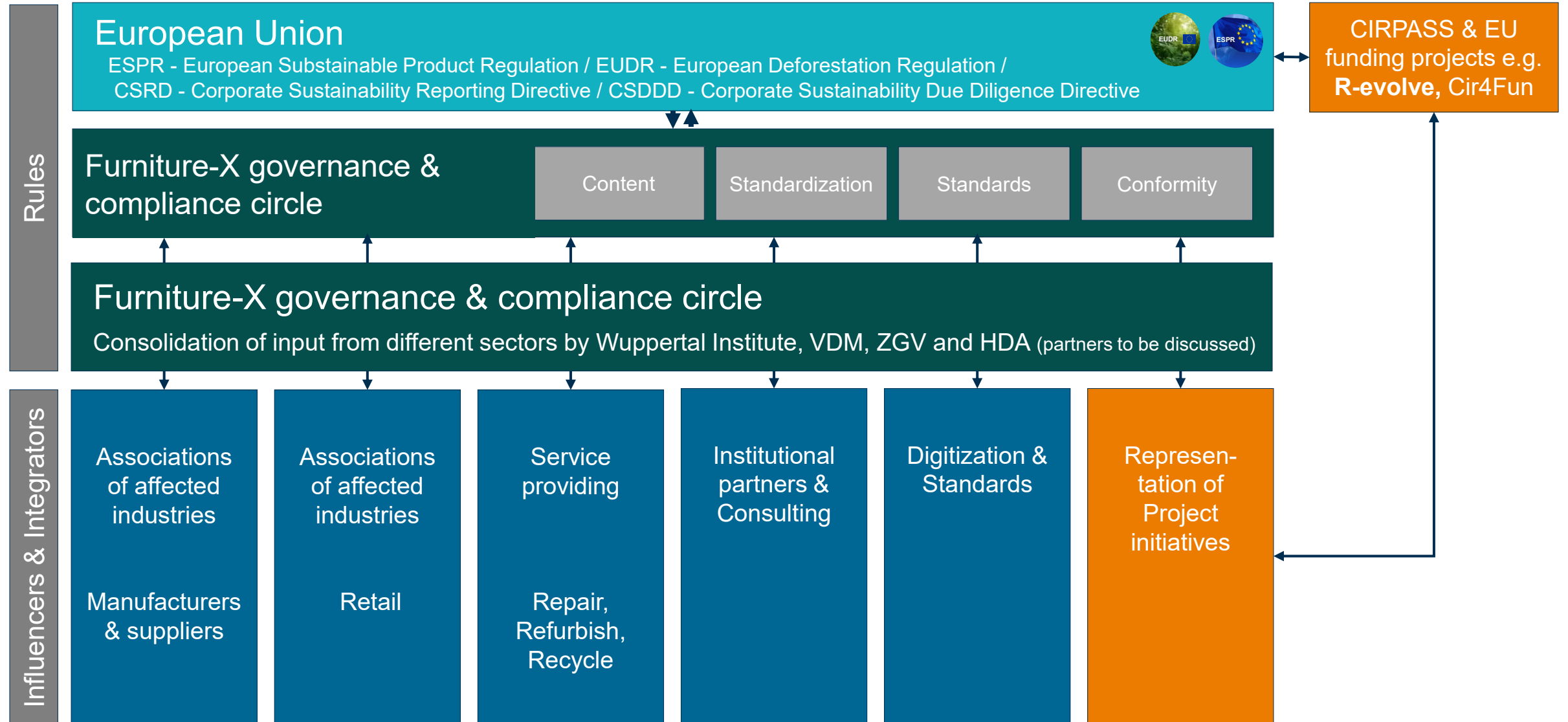
Are digital twins allowed to contain information about the end customer??



Furniture-X governance & compliance circle



Furniture-X governance & compliance circle





Furniture-X

Thank you very much!



Integrated Worlds
ANNIVERSARY

On behalf of the initiators
of Furniture-X,
thank you for your interest.