



Chemistry 4.0

Growth through innovation in a transforming world

São Paulo/SP, December 8th, 2017



22º Encontro Anual
da Indústria Química

A short video introduction into the subject

Agenda

1 Trends

2 Chemistry 4.0

3 Recommendations

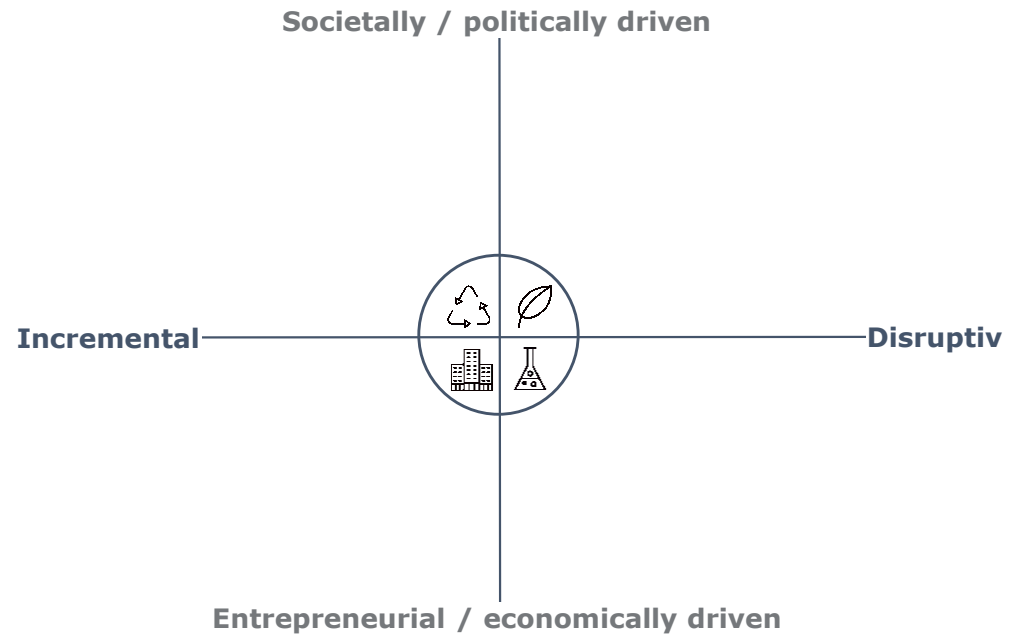
| Trends

We identified 30 major trends, that have an impact on the chemicals industry until 2030

Trends (30)

-  **Energy & Raw Materials (7)**
-  **Business-to-Business**
(construction, mobility, packaging) **(10)**
-  **Business-to-Consumer (3)**
-  **Agriculture (5)**
-  **Pharma & Health Care (5)**

Classification



Impact on chemicals industry

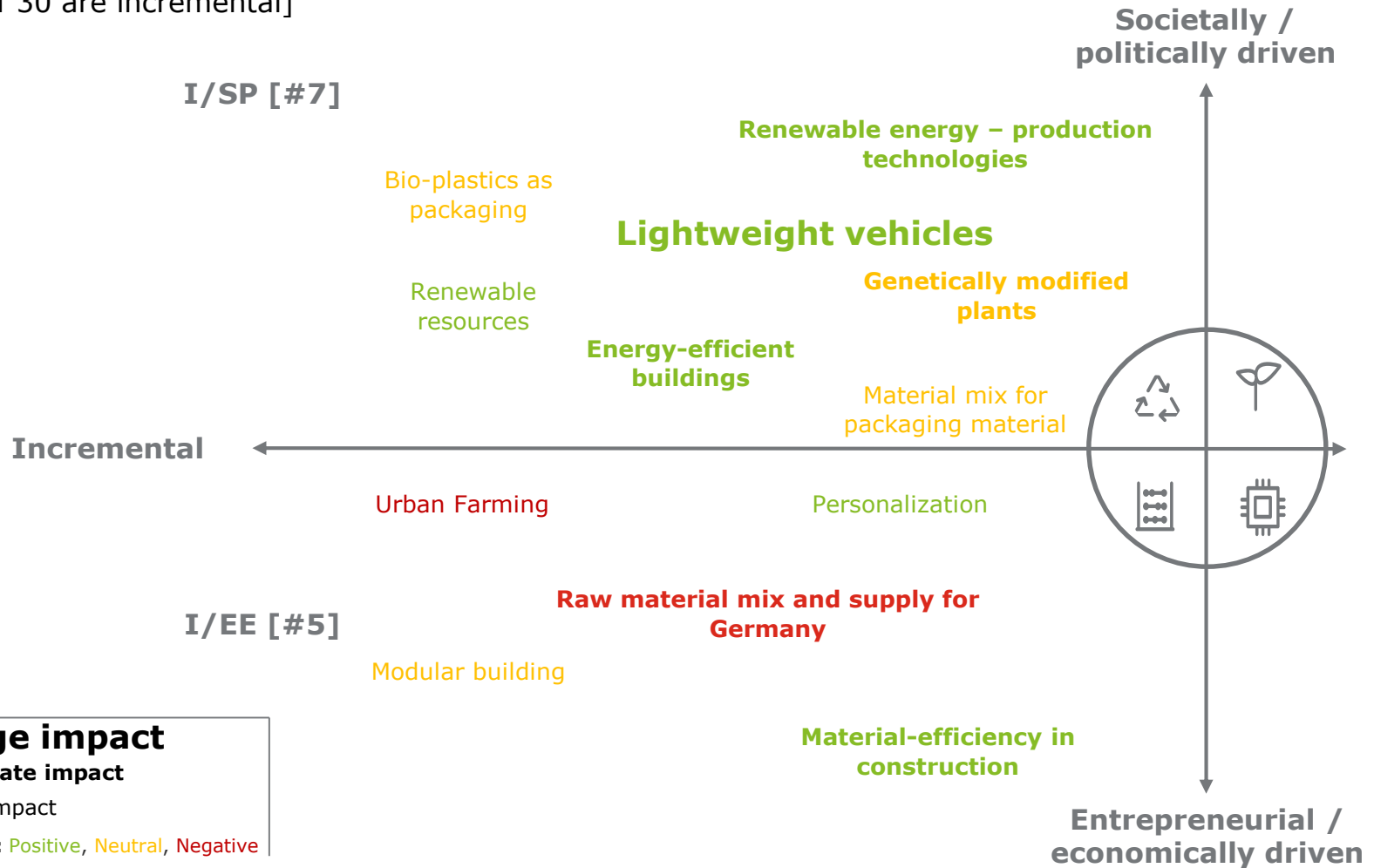
Small - Moderate - **Large Impact**

Positive – **Neutral/Winner-Loser** – **Negative impact on chemicals & pharmaceuticals industry**

Incremental trends are areas, where chemicals companies perform well. Additional opportunities through digital tools

Categorization of trends

[12 of 30 are incremental]



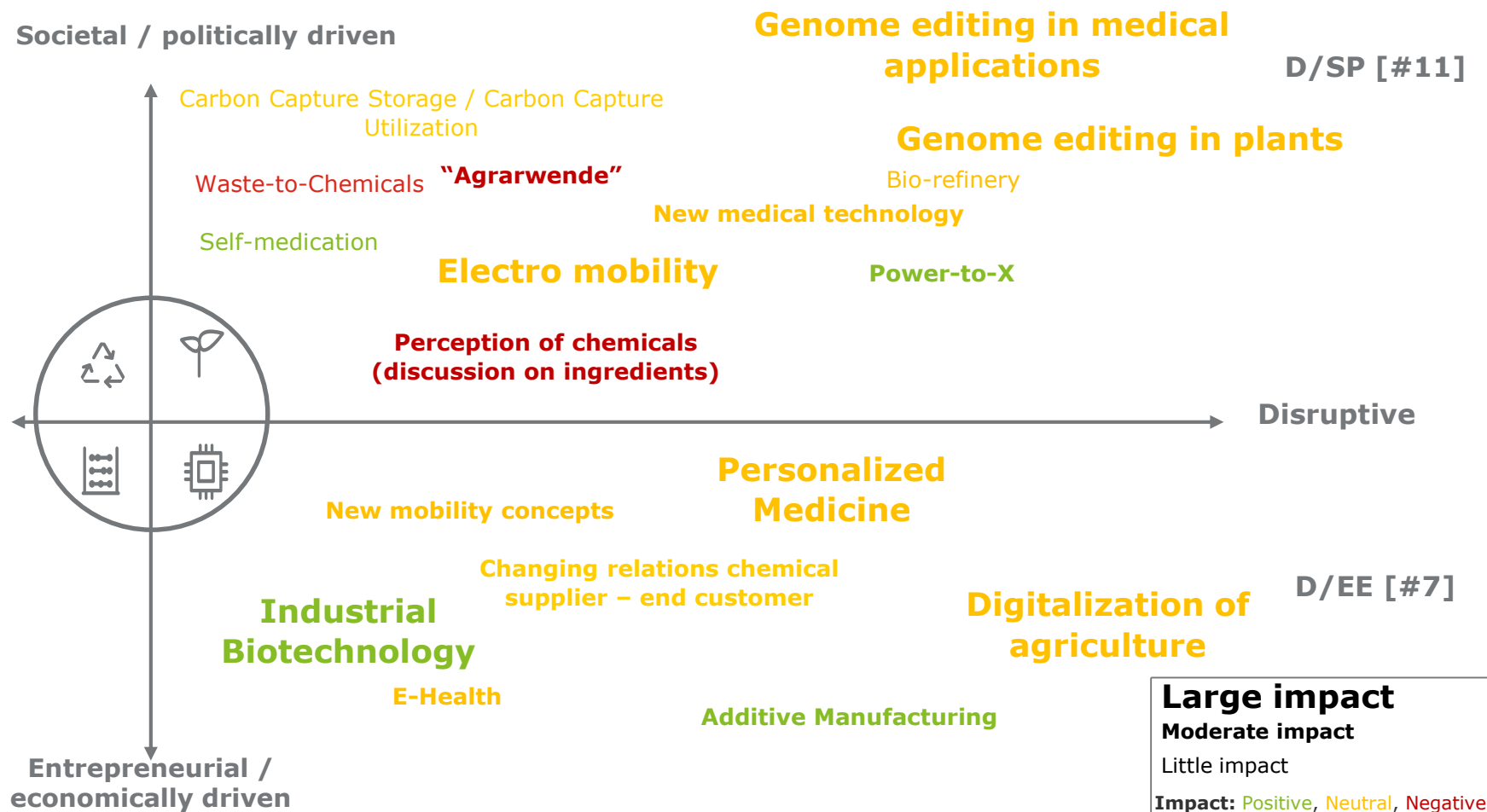
Incremental trends – New, lightweight vehicles and materials



Disruptive trends will have a fundamental impact on the chemicals industry, creating "winners" and "losers"

Categorization of trends

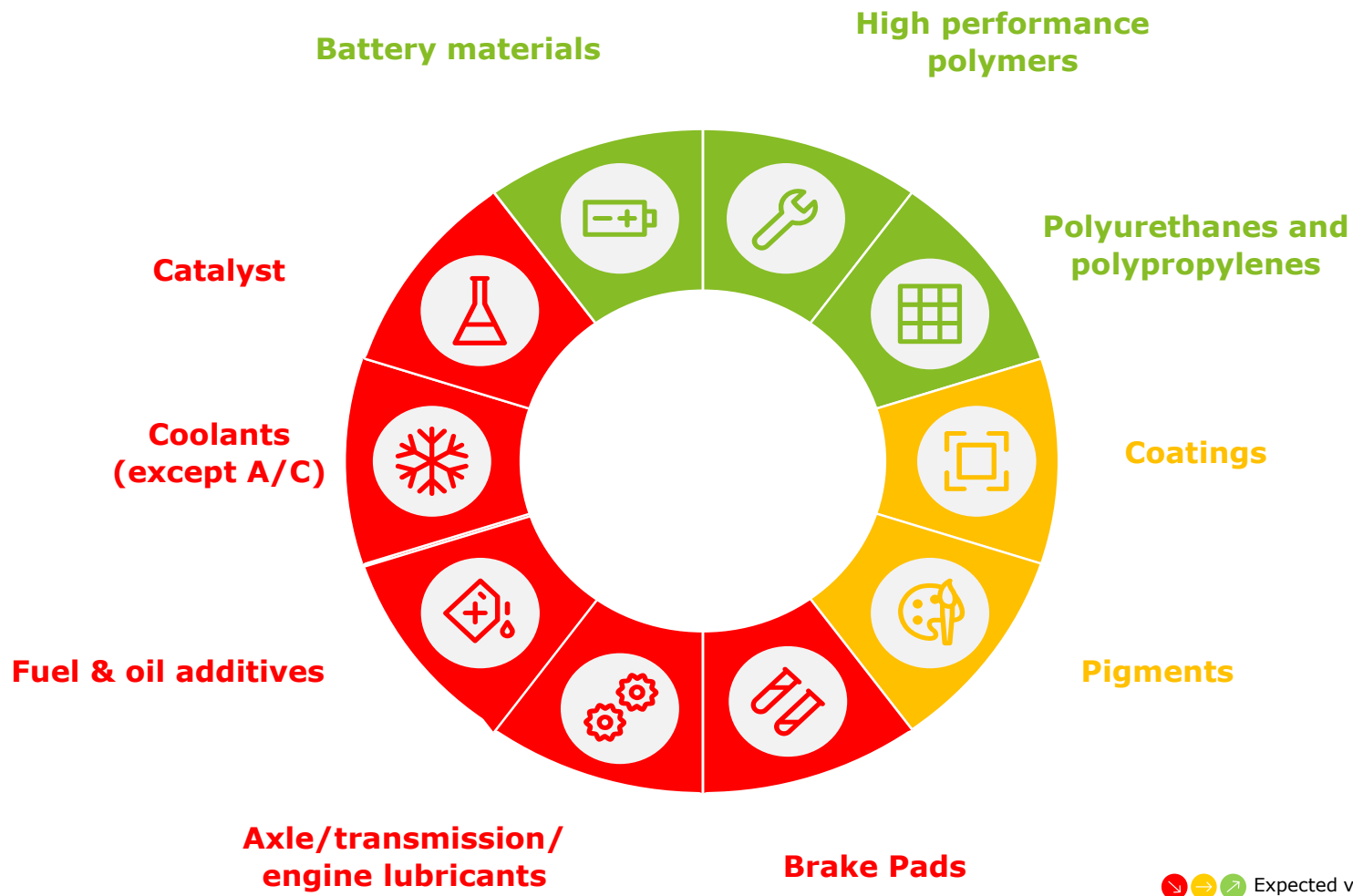
[18 of 30 are disruptive]



Disruptive trends - New, electric drive trains in cars

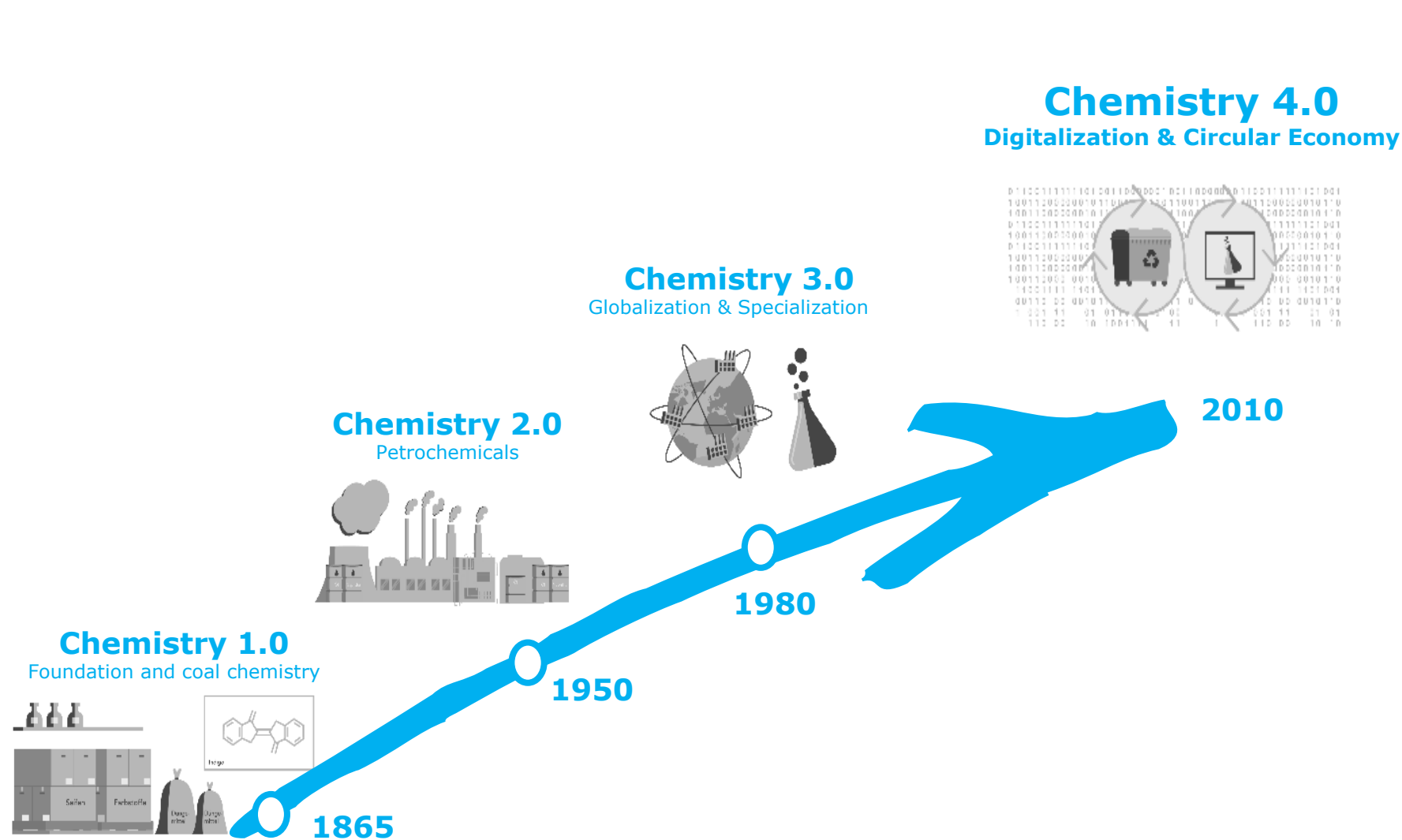
Schematic

Impact on chemicals & materials



2 Chemistry 4.0

Digitalization and Circular Economy are the essential elements of Chemistry 4.0, following the 1.0, 2.0 and 3.0 developments



The more disruptive the change, the bigger are customer needs.
 We see this as an opportunity for the chemicals industry

**Societal / political trends
 towards sustainability**

Schematic

**Incrmental
 Innovation**



**Disruptive
 Changes**

**Entrepreneurial / economically driven
 trends towards efficiency and new business opportunities**



Optimization

Better products and processes

Offering

New products and/or services (physical or digital)

Customer Relationship

New roles, new cooperations, partnerships and customer relationships

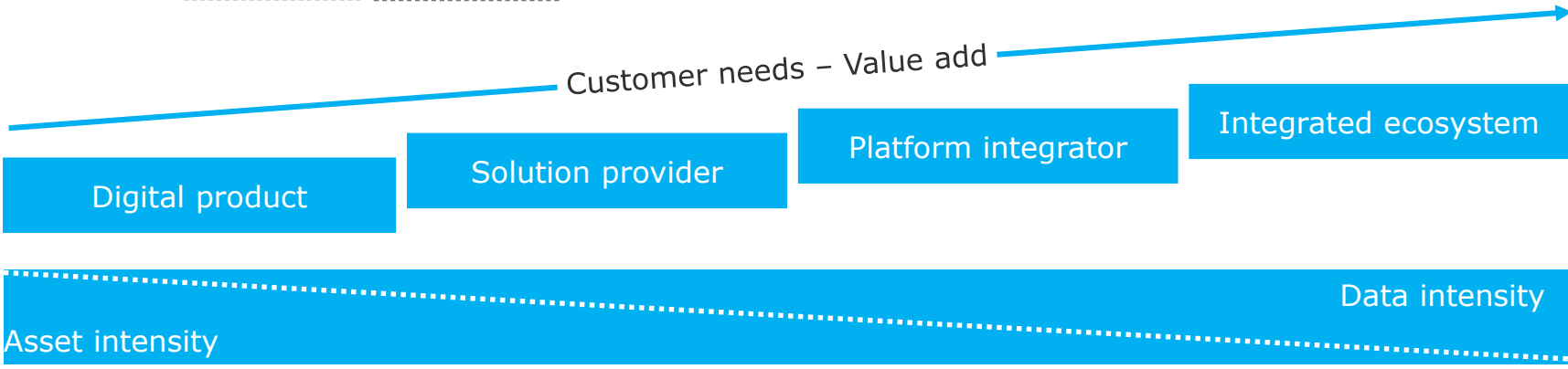
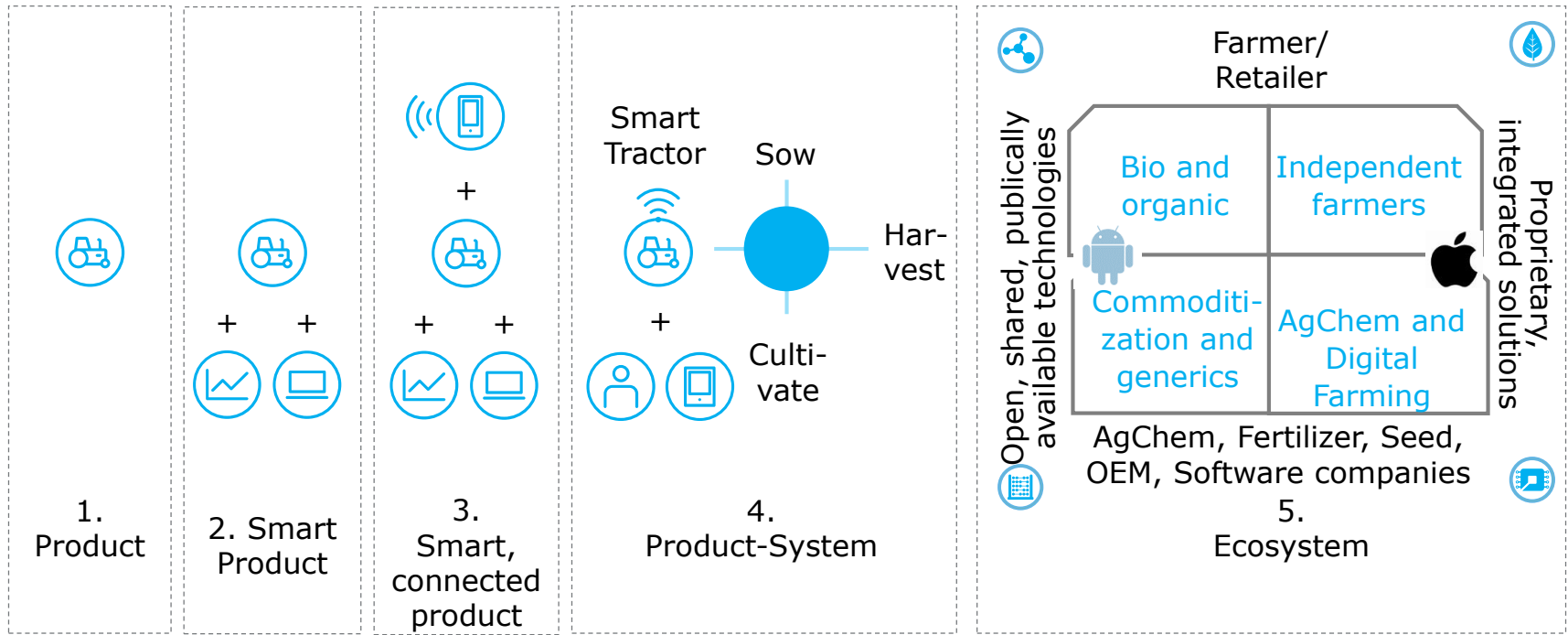
Business Model

New business models in new digital and circular economic networks

Increasing customer needs

New business model – Precision farming

Schematic

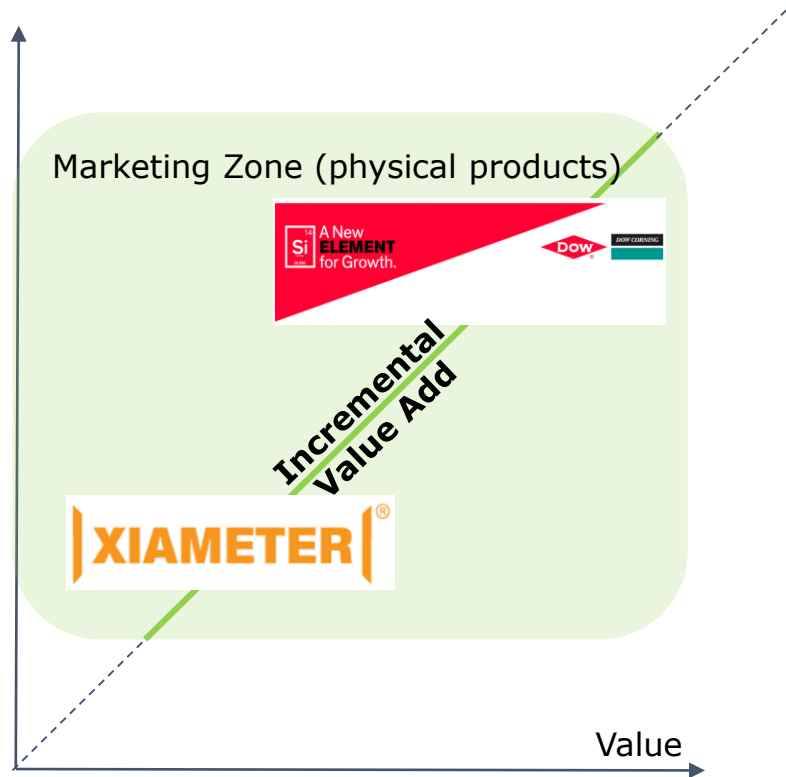


Avoid the "Digital Death Zone" of incremental value steps. New business models are about thinking big and winner takes it all

Schematic

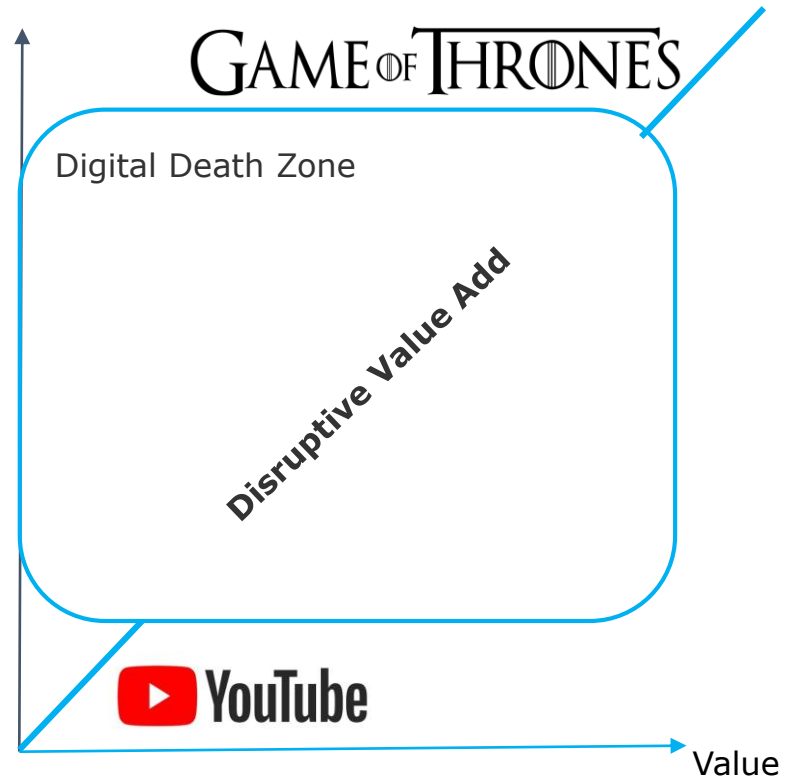
Physical product

Price per unit



Digital product

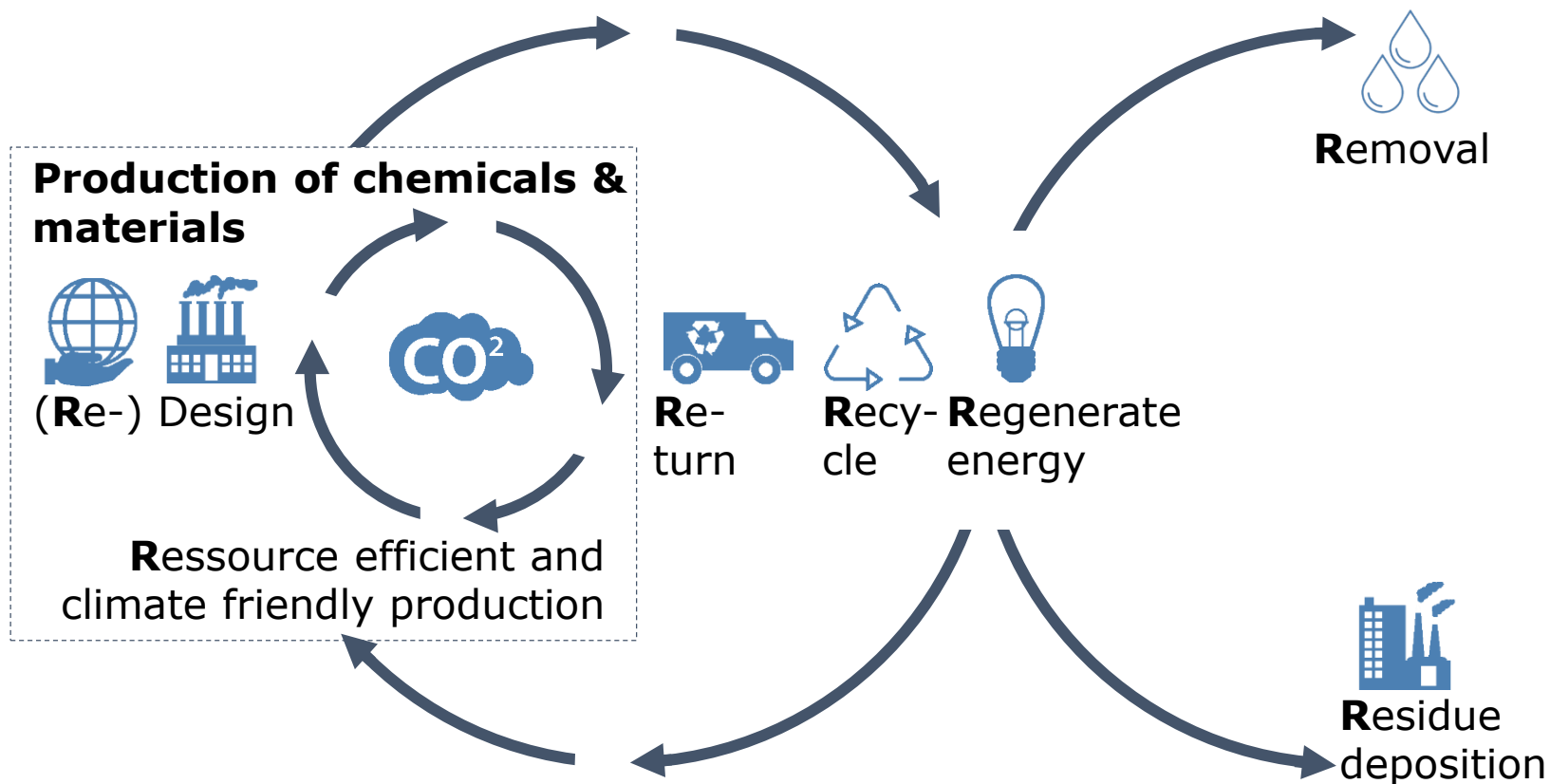
Price per unit



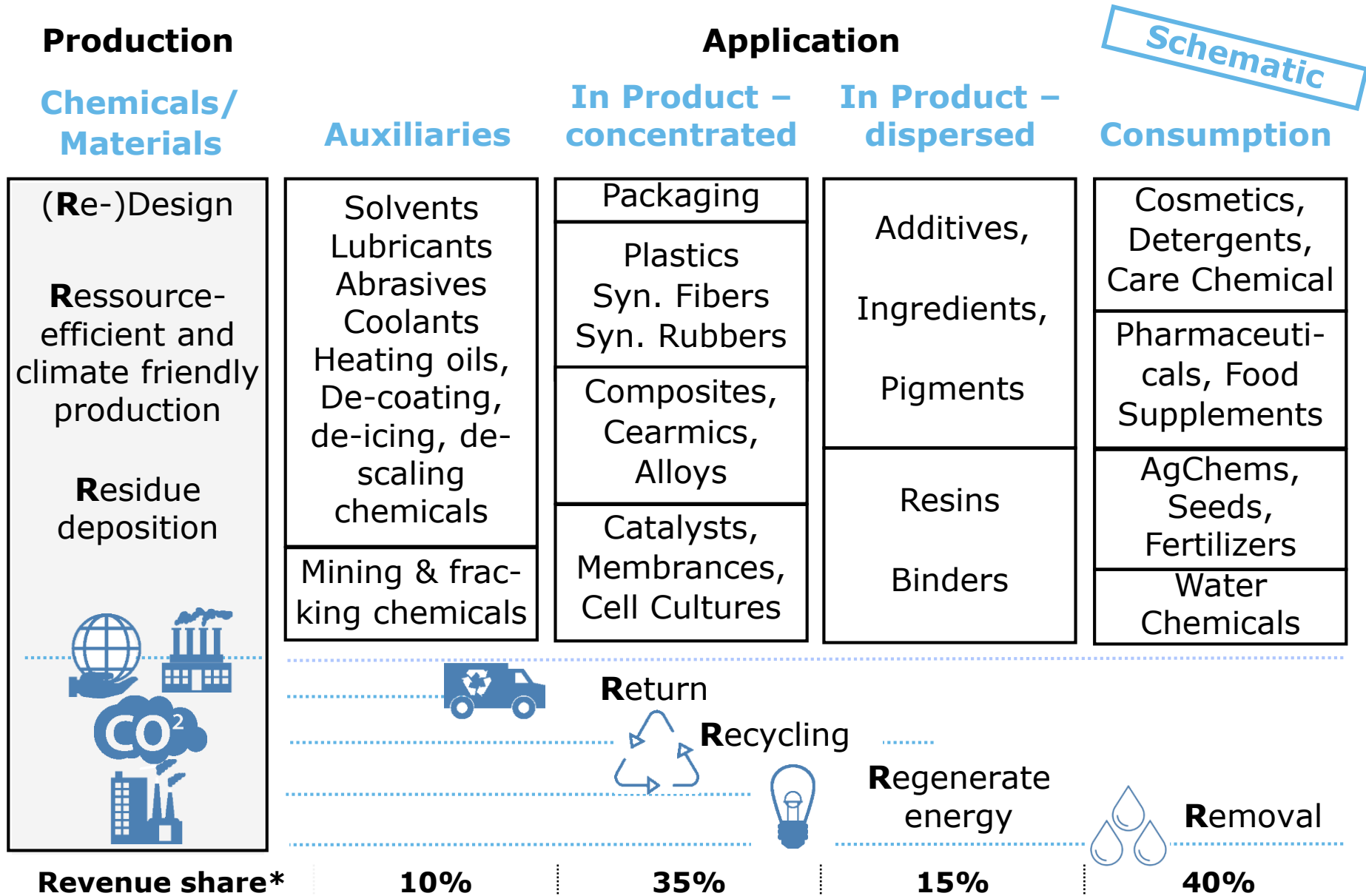
Societal, political and factual requirements increasingly demand higher resource efficiency. Seven "Rs" to accommodate this need

Schematic

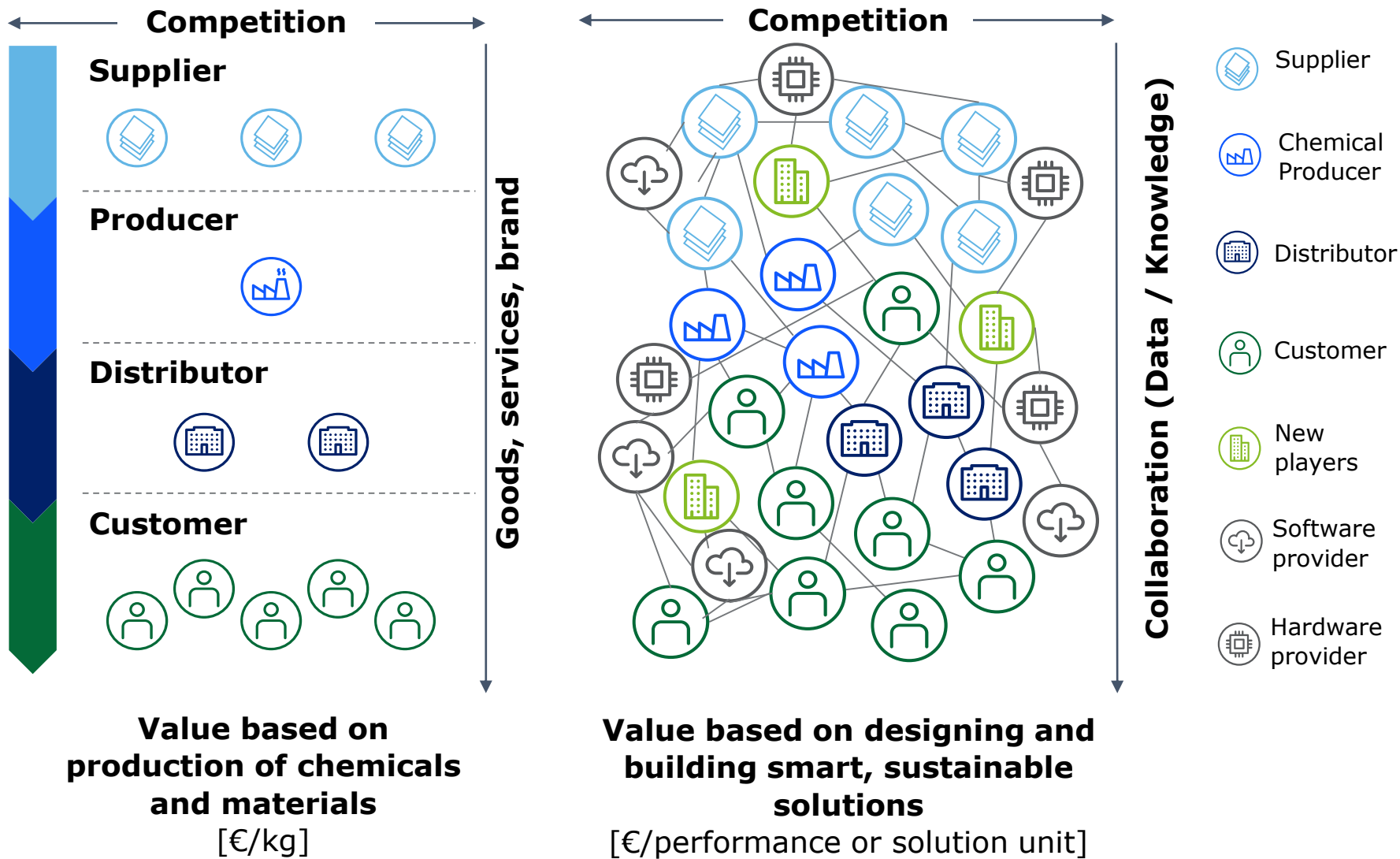
Application of chemicals & materials



Application of chemicals and materials with different characteristics - determine the use of the seven circular economy levers

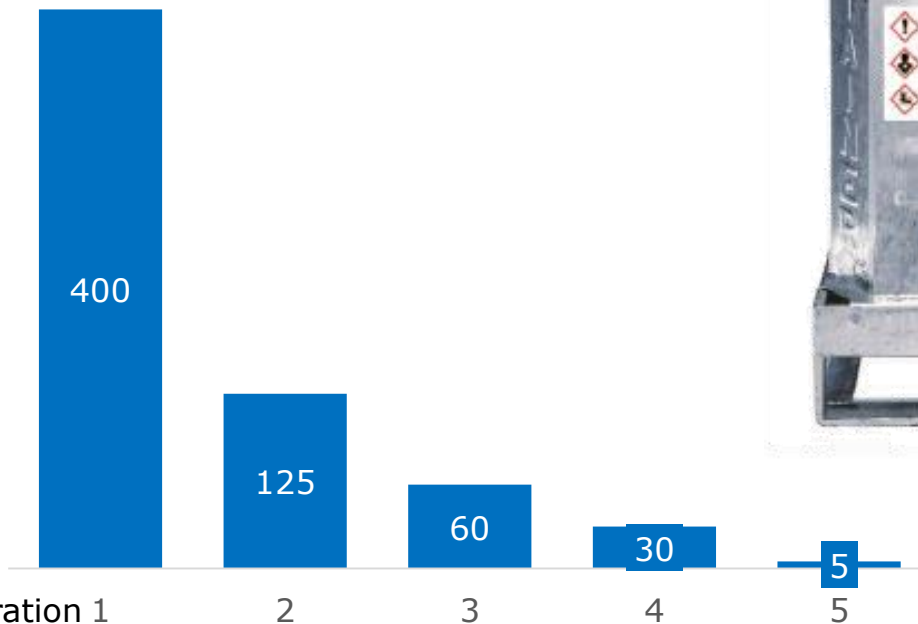


Chemistry 4.0 – From linear business models to new, complex – often circular - ecosystems



Approach & Results

- Closed, dual-wall SafeTainer-System
- Chemical leasing paid per kg of cleaned clothing
- Ecosystem of dry cleaners, cleaning equipment manufacturers, recyclers and distributors
- Digital track-and-trace next step
- Effect – Drastic decline of mg halogenated solvent use per kg of clothings:



Generation 1

2

3

4

5

3 Recommendations

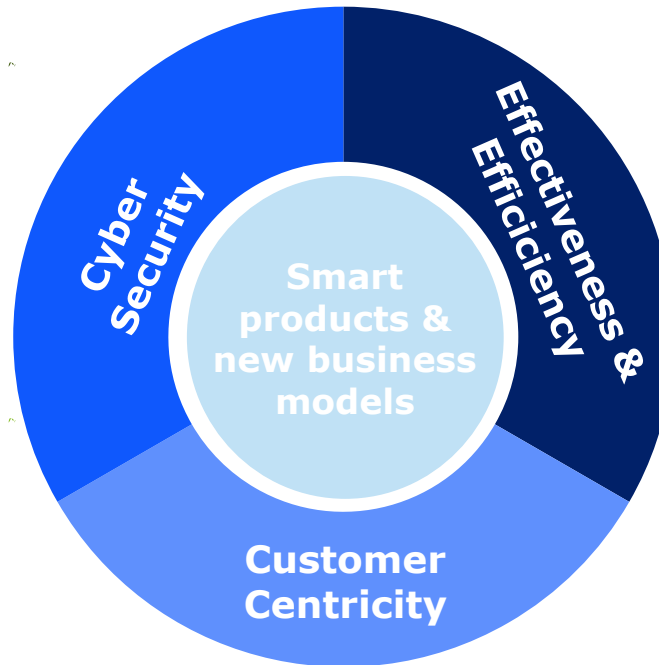
Companies should secure their systems, become customer centric, enhance effectiveness & efficiency and explore new business models

Cyber Security

- **Process data**
- **Customer & supplier data**

Customer Centricity

- **Efficiency & Convenience**
 - No touch orders
 - Track-&-Trace systems
 - Integrated Omnichannels
 - Direct sales / Exclusive Distributor cooperations
 - Participate in platforms
- **Customer Experience**
 - Online technical services
 - Digital products & services
 - Personalization & integration
 - Collaborative & communicative
 - Attractive for millenials



Effectiveness & Efficiency

- **Robot Process Automation (RPA)**
- **Workforce management** (own & 3rd parties)
- **Preventive & predictive maintenance**
- **Process improvement**

Smart products & new business models

- **Additive manufacturing** (where applicable)
- **Open innovation**
- **New ecosystem & Digital Business Models in a Circular Economy**
 - Solution / Performance based
 - Co-operations and platforms
 - New concepts for participation

**Thank you for
your attention!**