CIRCULAR ECONOMY 4.0
Enabling the circular economy using smart data

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Phase 1: Digitalization of machines and isolated process steps
  ➔ efficiency of singular working steps

Phase 2: Digitalization of production environments and process chains
  ➔ efficiency of integrated processes

Phase 3: Digitalization of ecosystems & business-processes
  ➔ holistic view

A SHORT HISTORY OF DIGITALIZATION
DIGITAL TRANSFORMATION UTILIZES A HOLISTIC APPROACH

Focus on benefit & impact

Humans & Environment

Digital Transformation

Distributed and interrelated value-creation

Business

Technologies

Enabler
TECHNOLOGY ENABLES THE CREATION OF COMPLEX INNOVATION ECOSYSTEMS

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ADVANCED DATA SERVICES ENABLE OPTIMIZATION OF ENERGY & RESOURCE USAGE

Digital Transformation supports Sustainable Development by providing a holistic view integrating business, social, and environmental aspects of value chains across organizations.
CIRCULAR ECONOMY

- Aims to minimize resource input, as well as waste and emission production by
  - Maximum efficiency in the use of finite resources
  - Gradual transition to renewable resources
  - Recovery of materials and products and the end of their life-time.

- Principles:
  1. Minimize waste and pollution
  2. Extent useful life of products and materials
  3. Regenerate natural systems
ENABLING THE CIRCULAR ECONOMY

Environmental Perspective (usage of resources)

Social Perspective (impact on society / humans)

Business Perspective ()

Planning  Production  Operation  End-of-life

Efficiency  Usage

Reuse  Refurbish  Recycle  Re-Design

Data

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CIRCULAR ECONOMY BUSINESS MODELS (CEBM)

Circular Supply Chains
- Sustainable usage of resources (e.g. recycleable materials, renewable energy, etc.)
  ➞ Requires data on availability of materials, synchronize energy demand/need, etc.

Resource Recovery
- Recover useful resources/energy out of disposed products or by-products
  ➞ Requires information on materials & quality along life-cycle

Product Life Extension
- Extend working lifecycle of products and components
  ➞ Requires data on spare parts (store/rebuild), product design, etc.

Sharing Platforms
- Increased product usage by making possible shared use/access/ownership
  ➞ Requires planning of usage & flexible billing processes

Product as a Service
- Offer product access and retain ownership to encourage responsible use
  ➞ Requires flexible business processes & advanced product maintenance

Source: Accenture (2014) "Circular Advantage"
DATA SPACES

Integrating data & services along the value-chain

• Data spaces provide a **domain specific ecosystem** to
  • **utilize data & services** across organizations
  • **share & monetarize data**
  • **provide data-based services**

• **Key design principles**
  • federated
  • interoperable
  • managed
  • trustful
GAIA-X ENABLES DATA-DRIVEN SERVICES
EXAMPLE FOR BATTERY DATA SPACE

Reducing waste and supporting reuse of batteries

• EU initiative to establish a **battery passport** to minimize environmental impact of batteries
  • Increase use of recycled material
  • Extend period of use
  • Reduce waste across life-cycle
• Batter data space enables **efficient refurbishment & recycling** by collecting information along the life-cycle
  • Raw materials used
  • Production parameters
  • Usage characteristics
Anomaly detection in operation of windmills to detect critical failures and prevent stand-stills

EXAMPLE FOR ENERGY DATA SPACE

Image: Fraunhofer IML
EXAMPLE FOR MOBILITY DATA SPACE

Data integration to ensure traffic flow and offer new services
THANK YOU!

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