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Germany | Canada
CHAIR 2024–2025

Eureka CO-CHAIR 2024/25

Circular Value Creation Pilot Initiative
Workshop 5
#circulartechnologies

07.03.2025

Federal Ministry of Education and Research

DLR Projektträger

National Research Council Canada | Conseil national de recherches Canada

Introduction

The international Eureka network, which links as many cycles as possible, creates intersections that significantly simplify the implementation of circular processes. To achieve this, we need to think about and discuss a systemic approach, the right data economy, the people who will implement this and the necessary technologies.
In order to incorporate the diverse global requirements and objectives, it is necessary to discuss them in an international process with experts from the Eureka member countries and to derive research needs and recommendations for action for policy-makers. From July 1, 2024 to June 30, 2025, Canada and Germany co-chair Eureka. As part of this the vision of circular value creation will be further developed. Individual areas of the vision, so-called vision clusters, will be discussed in several design thinking workshops in order to create the basis for an economic, social and ecological realisation of the vision – research needs and political recommendations are the results in each case. The results will be summarized and leading to an Eureka Call in June 2025.

The following workshop documentation summarizes the results for **#circulartechnologies.**

Workshop set up

#circulartechnologies

Location: World Conference Center Bonn

Date: 07.03.2025

Process: 3-Phase Design Thinking process with a focus on

1. developing a common understanding for the challenge;
2. empathizing with users via pre-scheduled video conferences;
3. defining specific needs regarding the challenge.

DESIGN THINKING PROCESS

Focus and selected methods

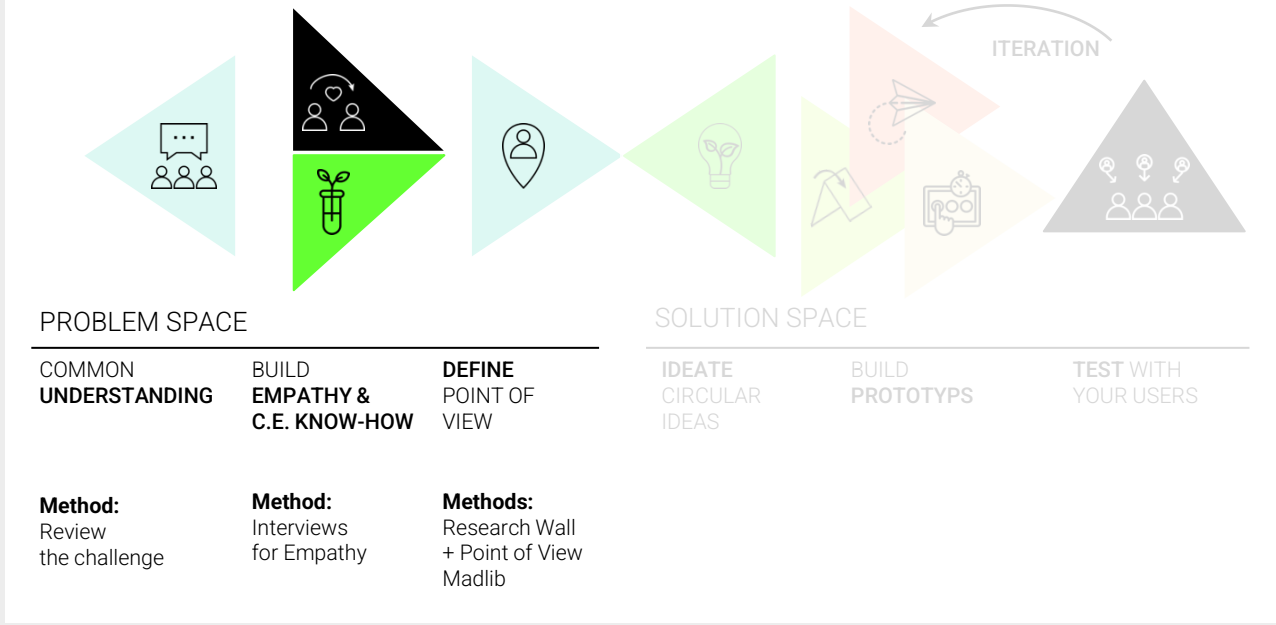
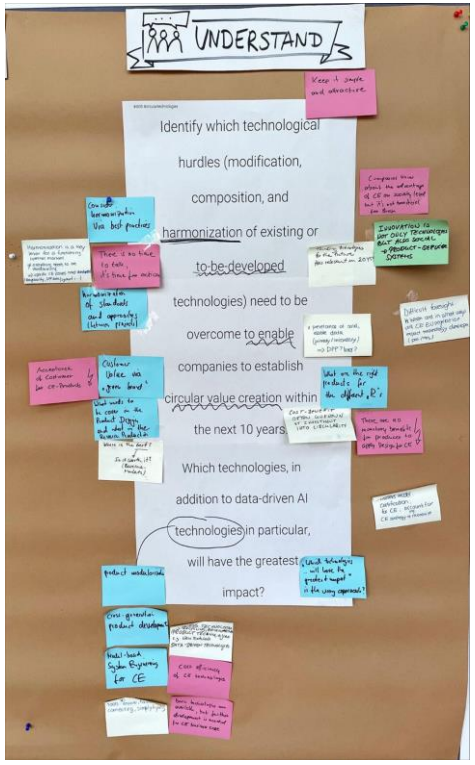


Illustration by Susanne Mira Heinz 2014. CC - BY - SA 4.0.

Challenge sentence

#circulartechnologies

The subject matter experts focused on the following challenge sentence:



Identify, which technological hurdles (modification, composition, and harmonization of existing or to-be-developed technologies) need to be overcome to enable companies to establish circular value creation within the next 10 years.

Which technologies, in addition to data-driven AI technologies in particular, will have the greatest impact?

Define Point of View

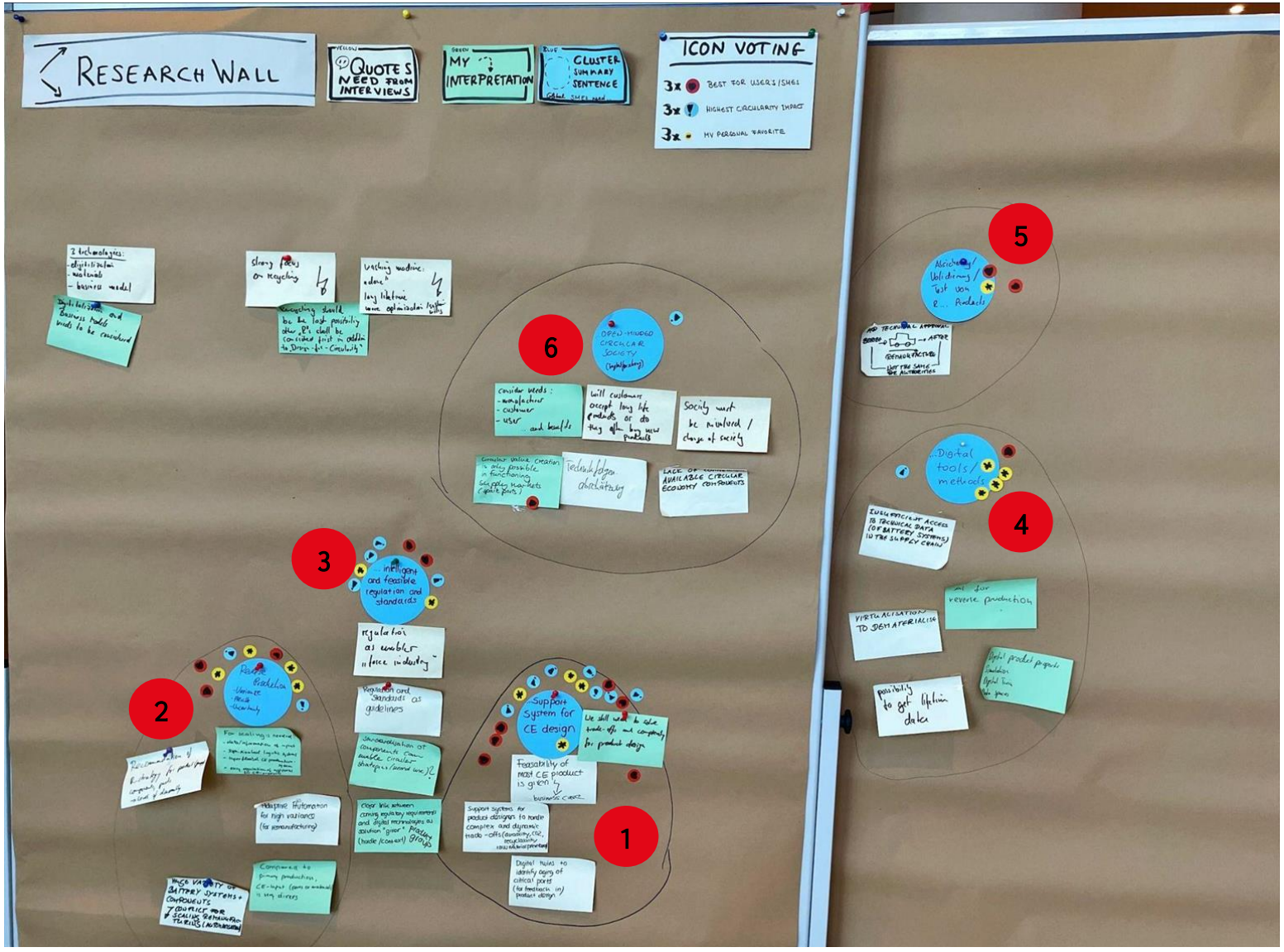
Outcome: Research Wall (Overview)

Color Code: Sticky Notes

Quotes/ Key insights from interviews + Ind. interpretations of subject matter experts → Cluster Summary sentence: **SMEs need...**

Explanation: Voting → Priority is indicated by sum of all icons given to a "Cluster Summary Sentence"

Best for users/SMEs | Highest Circularity Impact | My personal favorite



Research Wall 1 | 6

Written version

Color Code:
Quotes/ Key insights from interviews + Individual interpretations of subject matter experts → Cluster Summary sentence: **Global SMEs need...**

1

Theme: Support System for CE product design

Quotes/ needs from interviews

- Feasbility of most CE products is given - but conflicts with business case
- support systems for product designers to handle compley and dynamic trade-offs (durability, CO2, recyclability, raw material prevalence)
- Digital twins to identify aging of critical parts (for feedback in product design)

Individual interpretations of subject matter experts

- we still need to solve trade-offs and complexity for product design

→ Concluding summary sentence: Global SMEs need **a support system for CE design.**

Research Wall 2 | 6

Written version

Color Code:
Quotes/ Key insights from interviews + Individual interpretations of subject matter experts → Cluster Summary sentence: **Global SMEs need...**

2

Theme: Reverse Production

Quotes/ needs from interviews

- Recommendation for R-Strategy for product, parts, components (level of disassembly)
- Adaptive Automation for high variance (for remanufacturing)
- High Variety of Battery Systems and components - conflict for scaling remanufacturing (Automatisation)

Individual interpretations of subject matter experts

- For scaling is needed: data/information for input, sophisticated logistic systems, super flexible CE production systems, easy regulation for approval of CE products

→ Concluding summary sentence: Global SMEs need support on reverse production (variance, flexible, uncertainty).

Research Wall 3 | 6

Written version

Color Code:
Quotes/ Key insights from interviews + Individual interpretations of subject matter experts → Cluster Summary sentence: **Global SMEs need...**

3

Theme: Regulations and standards

Quotes/ needs from interviews

- regulation as enabler “force industry”
- regulations and standards as guidelines

Individual interpretations of subject matter experts

- standardisation of components can enable circular strategies (and use)?
- Closer link between coming regulatory requirements and digital technologies as solutions “giver” (hurdle/context) / Product Group

→ Concluding summary sentence: Global SMEs need **intelligent and feasible regulations and standards.**

Research Wall 4 | 6

Written version

Color Code:
Quotes/ Key insights from interviews + Individual interpretations of subject matter experts → Cluster Summary sentence: **Global SMEs need...**

4

Theme: Digital tools/methods

Quotes/ needs from interviews

- Insufficient access to technical data (of battery systems) in supply chain
- Virtualisation to dematerialise
- Possibilty to get life-time data

Individual interpretations of subject matter experts

- (..) for reverse production
- Digital Product Passport, Simulation, Digital Twin, Data Spaces

→ Concluding summary sentence: Global SMEs need digital tools and methods.

Research Wall 5 | 6

Written version

Color Code:
Quotes/ Key insights from interviews + Individual interpretations of subject matter experts → Cluster Summary sentence: **Global SMEs need...**

5

Theme: Absicherung/Validierung/Test von R.. products (eng.: Protection/Validation/Testing of R...products)

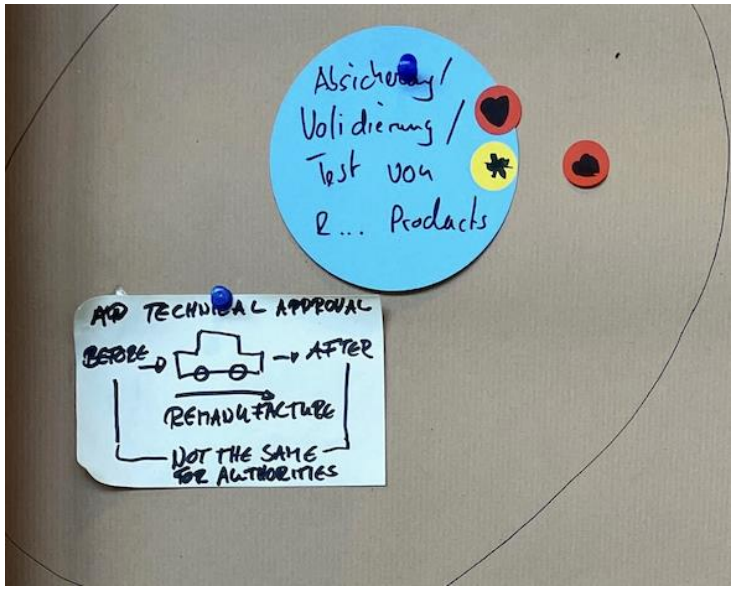
Quotes/ needs from interviews

- Add technical approval before and after remanufacturing (not the same for authorities)

Individual interpretations of subject matter experts

- ...

→ Concluding summary sentence: Global SMEs need Protection/Validation/Testing of R...products.



Research Wall 6 | 6

Written version

Color Code:
Quotes/ Key insights from interviews + Individual interpretations of subject matter experts → Cluster Summary sentence: **Global SMEs need...**

6

Theme: Circular mindset

Quotes/ needs from interviews

- Technikfolgenabschätzung
- will customers accept long life products or do they often buy new products?
- Society must be involved
- Change of society
- Lack of (..) available circular economy components

Individual interpretations of subject matter experts

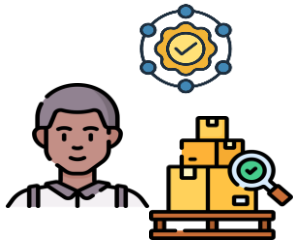
- consider needs (manufacturer, customer, user) ... and benefits
- circular value creation is only possible in functional supply markets (spare parts)

→ Concluding summary sentence: Global SMEs need open-minded circular-society (Begleitforschung).

Define Point of View

Outcome: Point of View (POV) Madlib

POV: Design consulting perspective



"Sustainable and cost efficient solutions."

John (35), CEO - design consulting

NEEDS reliable (product data) CE inputs (material parts, components)

BECAUSE more from manual 1:1 to mass market process for R-Strategies.

POV: SME Perspective

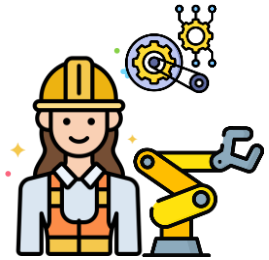
"I am a circular pioneer!"

Sarah (52), owner, manager, manufacturer

NEEDS CE-(product) design support system

IN ORDER TO level up circular technologies for her existing product design process.

POV: SME Perspective



Maria (38), CEO of a disassembly specialist

NEEDS flexible, adaptive, automated (reverse) production technologies

IN ORDER TO disassemble products into components and materials for reuse.

Final recommendation on **#circulartechnologies** of subject matter experts

Outcome: Point of View (POV) Madlib

Subject Matter Expert: Scientist

"Products, Production and business models must be developed simultaneously"

RECOMMENDS to combine circularity with innovation

BECAUSE nobody wants to have "old" and "outdated" products.

Subject Matter Expert: CEO

RECOMMENDS thinking digitalisation as an enabler

IN ORDER TO realize comprehensively circular strategies at all points of the life cycle.

Subject Matter Expert: Consultant

RECOMMENDS smart standards

IN ORDER TO *enable more harmonization on key CE issues (metrics of recyclability, recycled content, repairability etc.

*rising base of standards: intelligent way of sorting, combining - making them interoperable for machine leading

Subject Matter Expert: Scientist

RECOMMENDS to develop and use new CE-technologies

IN ORDER TO foster cost-efficient and high quality CE-solutions.

Subject Matter Expert: Scientist

"Let's make circular processes as efficient as their linear counterparts.."

RECOMMENDS to focus on scaling

BECAUSE the basic technologies are available.

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Ideation

Outcome: Brainstorming

Which 5 technologies, in addition to data driven AI technologies in particular, will have the greatest impact?

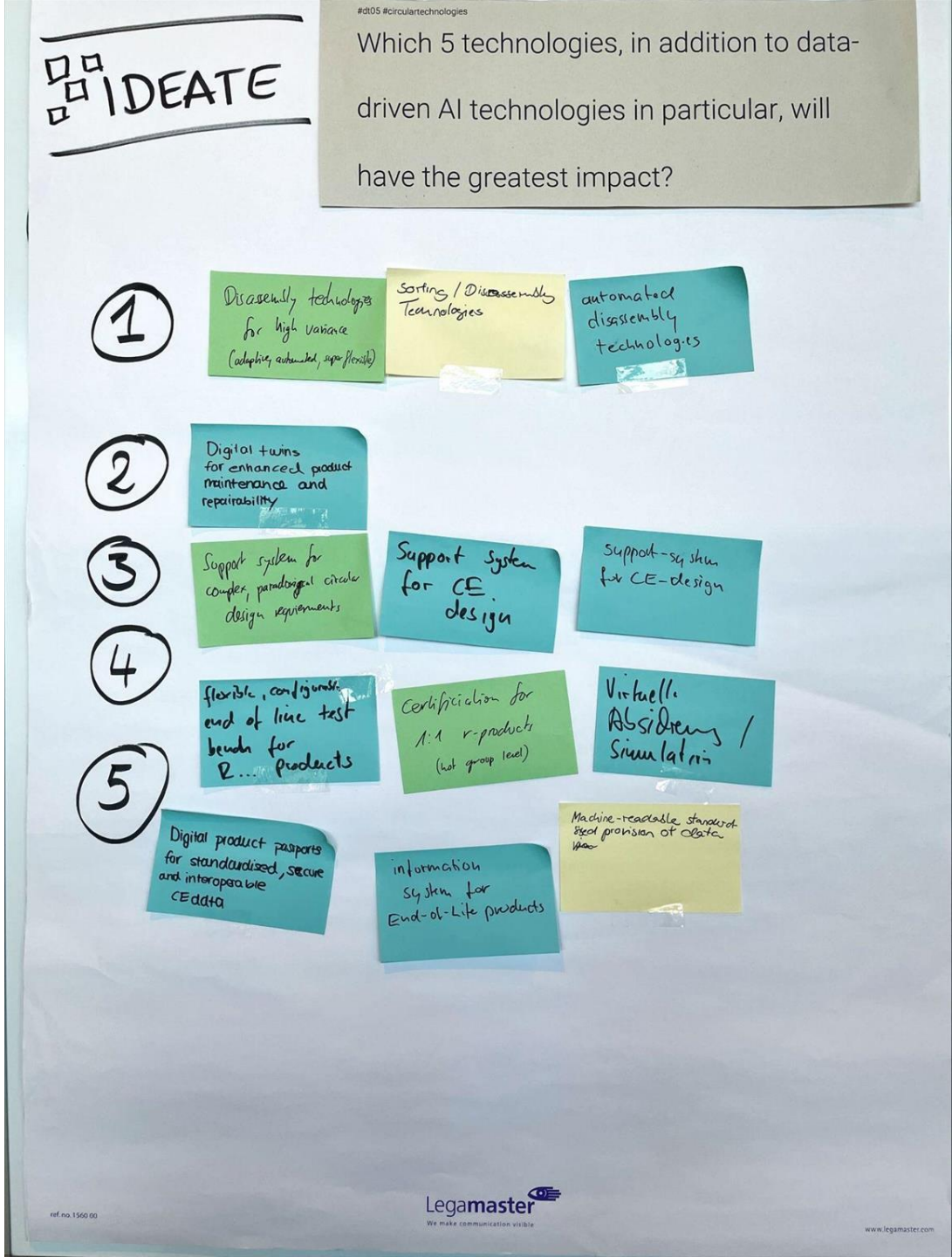
1 **Sorting/Disassembly technologies**
- Disassembly technologies for high variance (adaptive, automated, super flexible)
- automated disassembly technologies

2 **Digital Twins for enhanced product maintenance and repairability**

3 **Support system for CE-design**
- Support system for complex, paradoxical circular design requirements

4 **Virtuelle Absicherung/Simulation (eng.: Virtual safeguarding/simulation)**
- Certification for 1:1 r-products (not group level)
- flexible, configurable end of line tests (bends) for R...products

4 **Information system for end-of life products**
- Digital product passport for standardized, secure and interoperable CE-data
- Machine-readable standardised provision of data



Contact CVC Core Team

Dr. Henning Krassen

Federal Ministry of Education and Resarch (BMBF)

+49 228 99 57-3278

Henning.krassen@bmbf.bund.de

Michelle Lazaratos

National Research Council Canada (NRC)

+1 902 393 2515

Michelle.Lazaratos@nrc-cnrc.gc.ca

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Contact CVC PTKA Team

Project Management Agency Karlsruhe
Future of Work and Value Creation

Alexander Mager
+49 721 608-31427
alexander.mager@kit.edu

Dr. Cathrin Becker
+49 721 608-24580
cathrin.becker@kit.edu

Dorothee Weisser
+49 721 608-26150
dorothee.weisser@kit.edu

Daniel Adam
+49 721 608-31415
daniel.adam@kit.edu

Kai Martin Lickint
+49 721 608-26090
Kai.lickint@kit.edu

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