

Hitachi-AIST Cooperative Research on Circular Economy - Planning Standardization Strategies and their Implementation

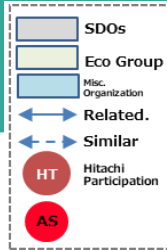


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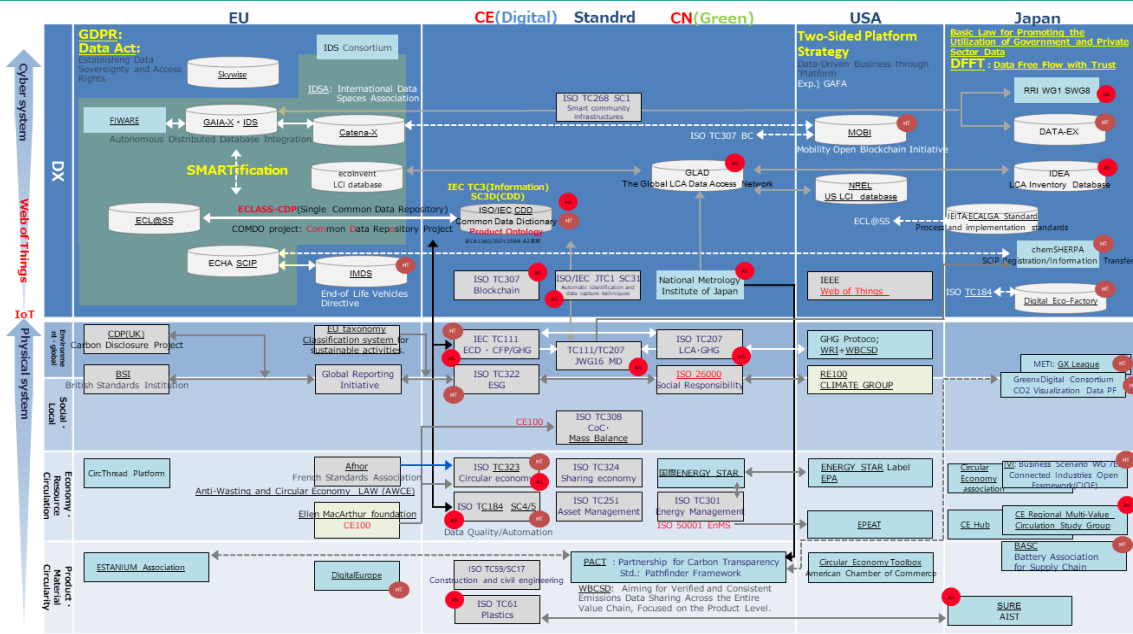
Introduction

To share and make effective use of the limited resources that exist in the planetary boundary, it is necessary to transition the industrial structure from a conventional linear economy of mass production and consumption to a circular economy (CE). One possible way to inducing such a major social behavioral change is the rule-making through international standardization.

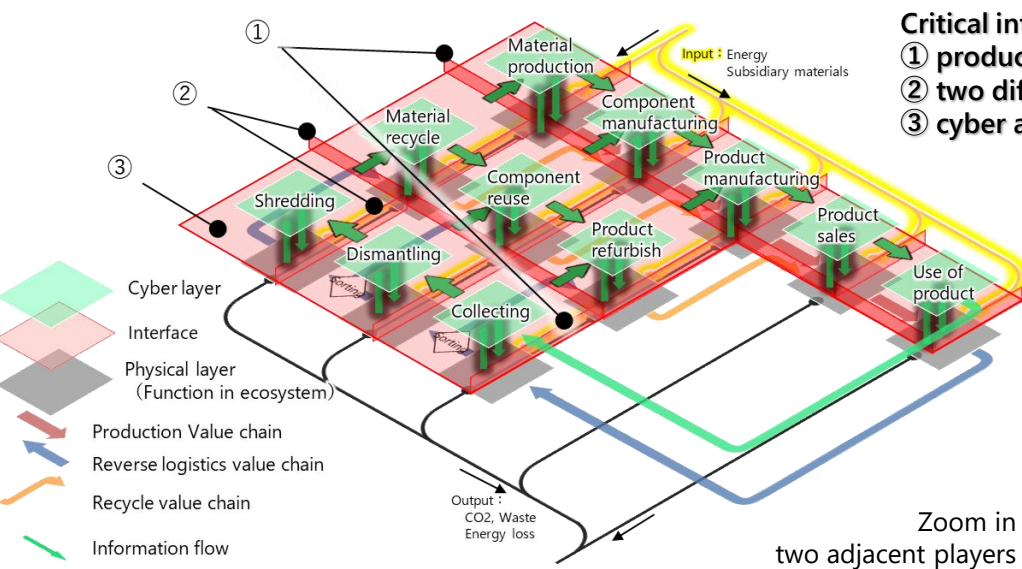
Bird's Eye View of the Rule-making Activities



- The relationships of standardization activities and rule-making communities related to the circular economy are visualized by region and by cyber and physical layers.
- In cyberspace, discussions on data space are progressing, especially in Europe. In contrast to these, Japan is still in a situation where it is difficult to see the direction regarding data inter operability.
- AIST and Hitachi are involved in many of these activities, and these resources could contribute to rule making.



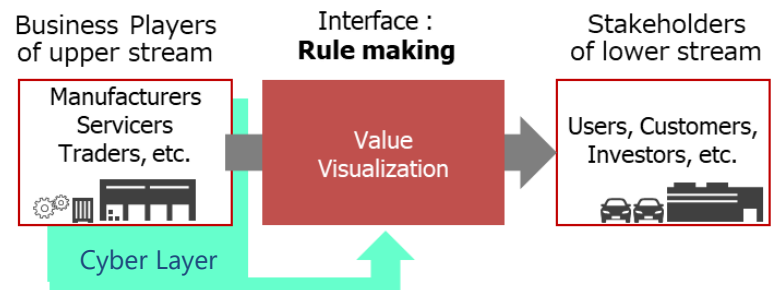
Rule-making in CE Value Chain



- Critical interfaces (I/F) for the rule-making between
- production players and recycle players
 - two different recycle players in reverse logistics value chain
 - cyber and physical layers

Rule-making of value visualization expands CE value chain.

- Lower transaction costs stimulate trading and broaden the value chain.
- Boosting the players' transitions to CE



Example of Value Visualization

- Grading can be
- Effective not only for transactions within the same industry, but also between different sectors.
 - Usable for material, product, facility or organization, etc.

Example of material grading [1]

| UG | Up-grade recycling | Recycled as expensive functional material |
|----|---------------------|---|
| 1G | 1st-grade recycling | Recycled as a raw material equivalent to natural resources |
| 2G | 2nd-grade recycling | Recycled as the same kind of lower grade raw material |
| 3G | 3rd-grade recycling | Recycled as an additive with no inhibit raw material properties |
| 4G | 4th-grade recycling | Used only its volume without using the original function |

Candidate of Standard Organizations

- ISO/TC 323 (Circular Economy) / WG3 (Measuring and Assessing Circularity)
- ISO/TC 323/WG2 (Practical Approaches to Develop and Implement Circular Economy)
- ISO/TC 268/SC1 (Smart Community Infrastructure)
- ISO TS/P 317 (Human-centered Transition Pathways)
- IEC SC 3D Common Data Dictionary

Conclusions and Outlook

- We created a bird's-eye view of international rule-making activities and clarified the status of both cyber and physical activities.
- We analyzed the architecture of the CE value chain and suggested the hypothesis that making rules to visualize indicators of value at the interface between each player will induce society into a circular economy and contribute to the formation of new markets.
- We will study value visualization and standardization more. And we will hold international meeting of experts in February 2024 to exchange opinions on standardization proposals and foster international consensus.

TC : Technical Committee, TS-P : Technical Specification Proposal, SC : Subcommittee, WG: Work Group
 [Acknowledgement] 1. Proposed by Dr. Tatsuya Oki, Prime Senior Researcher, AIST and Chairman, SURE Consortium, <http://unit.aist.go.jp/env-mri/sure/index.html>