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Government Accessing Business Data for Compliance Monitoring of Circular Economy

DATAPIPE White paper

Wout Hofman[1], Boriana Rukanova[2]*, Jolien Ubacht[2], Yao-Hua Tan[2], Elmer Rietveld[1], Jelmer Lennartz[1], Wirawan Agahari[2,3], Theodor Chirvasuta[1], Jonathan Schmid[2]

[1] *TNO, The Netherlands*

[2] *Delft University of Technology, Jaffalaan 5, 2628 BX Delft, the Netherlands*

[3] *Tilburg University, Warandelaan 2, 5037 AB, Tilburg, the Netherlands*

Abstract

To access business data for compliance monitoring of the circular economy (CE), governments would need to deal with issues of both legislative complexities arising from many new regulations in the area of CE and sustainability, as well as the digital complexity for accessing business data that resides in different business systems and data spaces. While earlier research has touched upon (1) the legal complexity through the identification of common high-level concepts of what to monitor, and (2) the digital complexities through the use of upper ontologies, so far these aspects have been treated to a large extent in isolation and not been linked systematically. In this research in progress paper, we propose an approach on how to link the two, discuss advances in the area and limitations, and identify areas that need to be addressed to allow governments to tap into the rich business data sources for compliance monitoring in the future.

1. Introduction

To facilitate the transition towards Circular Economy (CE), in the EU a number of CE-related legislations are being rapidly developed such the Battery regulation [1], the Eco-design for Sustainable Products Regulation [2], the Carbon Border Adjustment Mechanisms [3] to mention only a few. Legislations are being rapidly developed leading to legislative complexity. At the same time developments related to digital infrastructures and digital product passports have the potential for governments to access rich business sources for compliance monitoring purpose, but also bring complexity on the digital side on how governments can access these data sources. While earlier research has touched upon how to address (1) the legal complexity through the identification of common up-level concepts of what to monitor [8], and (2) the digital complexities through the use of upper ontologies [6], so far these aspects have been treated to a large extent in isolation and not been linked systematically. In this research-in-progress paper, we aim to connect the two. This research is part of the DATAPIPE[2] project. This study is based on

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* Corresponding author. B.d.rukanova@tudelft.nl

[2] https://www.tudelft.nl/datapipe

desk research of project documents, project scientific publication and literature review. The research team involved represents researches working on policy and legislative aspects, as well as researchers working on the digital aspects. The team worked jointly and had regular meetings to discuss progress in earlier research on both aspects and how to connect the two. The findings presented in this research-in-progress paper are a result of an iterative process, where we also identified areas for further research and standardization.

2. Sketching the problem

Figure 1 visualizes our problem domain. At the center of the figure, we position the need for authorities such as customs to access business data to fulfill legislative requirements. These include needs for customs risk analysis or needs of parties such as market surveillance authorities or policymakers. On the top part of the figure, we position the legislative environment. For example, customs must monitor various flows of goods based on the current legislation: the green document symbols.
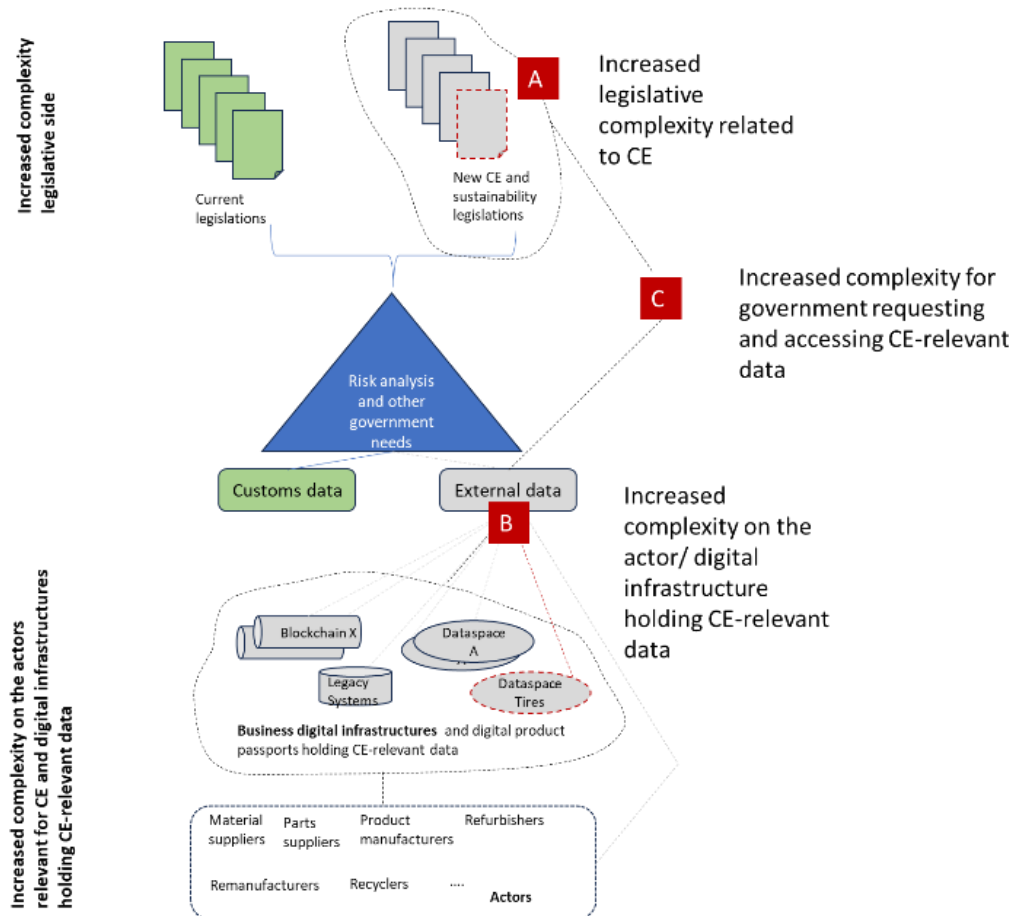

Figure 1: Sketching the problem of growing legislative and actor/ digital infra-structure complexity

Due to forthcoming CE legislation (the grey document symbols), customs may obtain new responsibilities for CE monitoring on a variety of product flows such as textiles, cars, plastics, steel, etc. Additional future legislation may be added for new product categories (e.g., tires; indicated by a dotted document symbol). This illustrates problem "A": customs and other authorities need to deal with increasing legislative complexity.

For the risk analysis, custom authorities currently use data that businesses submit in digital customs systems (the green "Customs data" symbol in the lower left part of the figure). Customs have also been experimenting with using external business data sources for customs risk analysis related to traditional tasks such as fiscal compliance and safety and security [7]. When future new legal requirements are imposed on businesses and digital product passports are implemented, customs may need to get access to the digital infrastructures of businesses to access mandatory product passport data (beyond what is communicated via the government channels) or to access business data that is voluntarily shared by the businesses to show compliance. In the CE context, there is a wide set of new business actors, which may hold valuable CE-relevant data in the future (e.g. material and parts suppliers, recyclers, re-manufacturers, etc.). Also for CE monitoring, access to continuously changing dynamic data such as Electric Vehicles battery state-of-health data may be relevant for the authorities and access to such data is even more challenging. This leads to problem "B": the increased complexity on the actor/digital side will occur. Due to heterogeneity, different actors will come to different semantic concepts if they do not collaborate (or align). And this will lead to inconsistency of semantics.

Because of the complexities of A and B, a challenge C comes into play for governments to access CE-relevant data. Especially if the government wants to work in a data-driven manner and wants to request data (or query data themself) from the digital infrastructures of the different businesses in a machine-readable way.

3. Proposed approach

In Figure 2 we propose an approach on how to address these problems, building also on earlier work. For allowing governments to query business data for CE-monitoring purposes (problem C in Figure 1), inherent sources of complexity remain both on the digital (Problem B) and the legal side (Problem A). To address problem C, some level of simplification on both the legislative and the digital side would be needed.

•　　　Recent research [8] suggested that to reduce the complexity on the legal side (shown with A*) an approach may be to identify a stable set of high-level concepts on the aspects that governments need to monitor based on these new legislations (in [8] they explored the potential of UN Recommendation 46 for that purpose). For example, several legislations refer to *CO2 footprint*, or *Recycled contentment in new products*, so these are concepts that can occur in different CE-relevant legislations and across a diversity of product groups, and it is not always clear if these are identical, or similar but distinct terms.

•　　　To reduce the complexity on the digital side, in previous research [6] it is proposed the use of upper ontologies aligned with lower ontologies (see B* in Figure 1). For example, when new legislation on e.g. tires is added, a tire lower ontology can be aligned with the upper ontology, which enables custom authorities to access data also from dataspaces that contain information about tires.

- For addressing problem C, the information request of governments towards the business infrastructures can then be formulated based on legislative requirements expressed through the high-level concepts (A*) and the link of these concepts to the upper ontology and related aligned ontologies (B*).
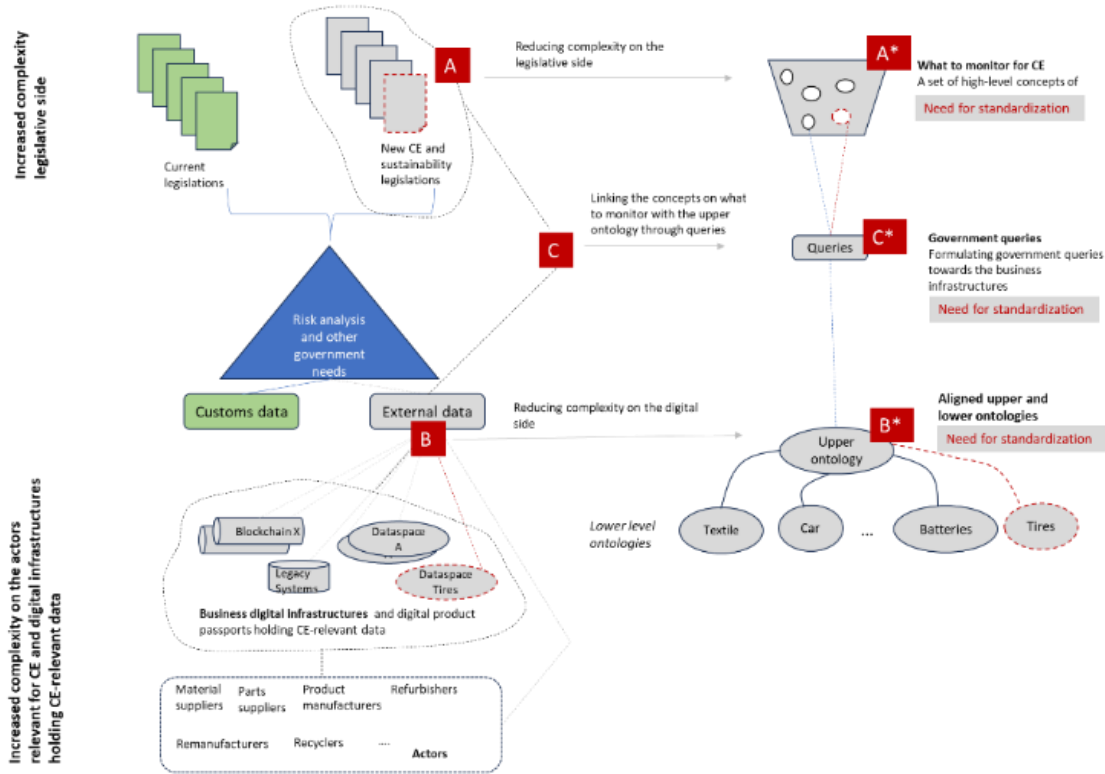

Figure 2: Proposed approach

Addressing problem C, however is not straightforward. While there is a proposal for a high-level framework with concepts to reduce the legislative complexity [8], further research is needed to evaluate its robustness and to further develop it. Next, it needs to be further defined how such a system of concepts can be used to define specific information needs of government towards the business infrastructure, how these can be standardized, and what level of standardization/ customization of the requirements (e.g. at National and EU level) would be feasible. The next question that needs to be addressed is how to link the concepts from the high-level framework (A*) and the specific information requirements to the concepts from the upper ontology (B*), how to formulate queries, and how to standardize those? To arrive at standardized queries (C*), a standardization on both the high-level concepts and the derived government requirements (A*) and the upper/ aligned ontologies (B*) for data in business systems may be needed.

4. Conclusions

For CE monitoring, governments need to standardize the queries they want to formulate towards the business infrastructure. Identification of high-level concepts for CE-related regulations and their requirements on what to monitor can help to reduce legal complexity. The complexity on the digital side can be reduced by the use of upper-level ontologies and aligned ontologies. With

standardization efforts on both sides, data access for CE monitoring can become a simpler process. However, this requires future research in several directions as follows:

• How to arrive at a stable high-level set of concepts? How to standardize these and at what level does this standardization need to take place?

• How to standardize the ontologies and what are governance scenarios for approaching this?

• How to use the high-level concepts and the aligned ontologies to generate standardized queries, and which governance scenarios are suitable for this in view of changes in future legislations?

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