United Nations Centre for Trade Facilitation and Electronic Business Solutions in Support of Digital Product Passports

Preface

Digital tools can play an important role in accelerating the shift to a circular economy. Digital tools can increase transparency along value chains and provide information, which in turn can help to extend the lifecycle of products.

Digital Product Passports (DPPs), for example, can inform consumers and businesses about products, materials, the conditions under which they are produced and their sustainability performance. This in turn can enable more responsible consumption and production choices and promote circular business models.

In the region of the United Nations Economic Commission for Europe (ECE) and beyond, several countries are currently introducing DPPs in their legislation to facilitate access to reliable product data. This is part of a broader trend, especially in advanced economies, where digital and green transformations are supported by a regulatory and policy framework.

The ECE has taken important steps to advance traceability and transparency in global value chains. The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT), a subsidiary body of ECE, has produced recommendations, standards and global pilots. UN/CEFACT data models and standards can support the development of DPPs by providing the respective standardised data structures supporting interoperable exchanges.

This paper (i) describes why ECE-UN/CEFACT standards and tools are ideally suited to support DPP development; (ii) explains which current and forthcoming ECE-UN/CEFACT standards and tools can assist in the development of DPPs, notably the traceability and transparency standards; and (iii) provides specific recommendations on how ECE-UN/CEFACT standards and tools could be further developed to support the adoption of DPPs.

This paper supports the outcomes of the seventieth Commission session on Digital and Green Transformations for Sustainable Development in the Region of the Economic Commission for Europe (E/ECE/1504) and is part of the ECE Sustainability Pledge initiative for sustainable value chains in critical sectors for the circular economy.

Note

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The United Nations Centre for Trade Facilitation
and Electronic Business (UN/CEFACT)

Simple, Transparent and Effective Processes for Global Commerce

UN/CEFACT's mission is to improve the ability of business, trade and administrative organizations, from developed, developing and transitional economies, to exchange products and relevant services effectively. Its principal focus is on facilitating national and international transactions, through the simplification and harmonization of processes, procedures and information flows, and so contribute to the growth of global commerce.

Participation in UN/CEFACT is open to experts from United Nations Member States, Intergovernmental Organizations and Non-Governmental Organizations recognised by the United Nations Economic and Social Council (ECOSOC). Through this participation of government and business representatives from around the world, UN/CEFACT has developed a range of trade facilitation and e-business standards, recommendations and tools that are approved within a broad intergovernmental process and implemented globally.

UN/CEFACT is committed to ensuring that the gender dimension is reflected in norms, roles, procedures, and access to resources. Government and trade are encouraged to promote equal opportunities for women and men within the scope of Trade Facilitation activities. UN/CEFACT specifically encourages the collection, analysis, and monitoring of gender disaggregated data in order to better understand and support women's engagement in international trade and transport facilitation.

This Recommendation encourages governments, business communities, development partners, international organizations, and other policymakers to follow UN/CEFACT's commitment to ensure inclusiveness for women.

Contents

I. Digital Product Passports as an enabler of responsible choices and circular business models

1. Digital tools can play an important role in the acceleration to a green economy. Critical aspects of this green and digital transition are becoming increasingly regulated, especially in advanced economies. One of the primary objectives of this increase in regulation is to enable access to accurate and reliable product data to foster responsible consumption and production choices and circular business models, which can help enhance resource efficiency. Consequently, this regulatory push is augmenting the importance of data collection and transparency along global value chains and among all stakeholders including businesses, competent national authorities and consumers.

2. In the ECE region, the European Union (EU) is at the forefront of this ambitious policy agenda. On 30 March 2022, the European Commission published a proposal for a new Ecodesign for Sustainable Products Regulation that provides a framework to make products placed on the EU market more durable, reusable, repairable, recyclable and energy efficient. This regulation introduces **performance** and **information** requirements, to be communicated to final users and consumers using a **Digital Product Passport (DPP)**. The EU DPP will be piloted and deployed in at least three key markets by 2024 (i.e. batteries, electronics and textiles). For specific sectors, namely textiles, DPPs will be made mandatory on all products sold in Europe by 2030[1].

3. The EU and its member States are not alone in developing DPPs to support the green transition. Similar work is also being undertaken in Australia[2] (for plastics and other recyclable materials), in China[3] (with their digital battery passport) and in the United States[4] (with initiatives increasing the importance of provenance data for battery materials and components).

4. DPPs create **a digital twin** of a **physical product**, as they digitally record comprehensive product information (which may refer to a product model, a batch or an item) and enable the data to be shared along the value chain. A data carrier giving access to this information, and connected to a unique product identifier, is physically present on the product.

5. The purpose of DPPs is to better inform businesses and consumers about products, including the materials used, the conditions under which they were produced and their impact. DPPs can also support the transformation to a circular economy by providing information on extending the life cycle of products and on supporting more circular business models (e.g. services, such as repair, resale and recycling).

6. By acting as a record of product compliance with standards for sustainability performance, DPPs will also play an instrumental role in facilitating verification by competent national authorities. Furthermore, they will improve end-to-end traceability of products along value chains.

7. A DPP contains data. However, in order for it to be accessed and used, a DPP system is also needed. A DPP consists of the following:

DPP data	DPP system
The "**what**" (product specific):	The "**how**" (product horizontal):
Possible track and trace identifiers such as product identifier; economic operator identifier; facility identifier.	Using all standards and protocols related to the IT architecture for exchanging and sharing DPP information.
Potential attributes such as description of material, component or product; recycled content; substances of concern; carbon and environmental footprint profile; classes of performance; technical parameters.	Using, in some cases, a DPP registry (an online tool to locate the information).

Source: ECE-UN/CEFACT, 2023

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1 For more information, see the EU Strategy for Sustainable and Circular Textiles, released in March 2022 at *https://environment.ec.europa.eu/publications/textiles-strategy_en*

2 For more information, see *Sydney Morning Herald* online article at *https://www.smh.com.au/national/why-your-plastic-cup-may-soon-have-a-passport-to-show-where-it-s-been-20230717-p5dosw.html*.

3 For information on the 2018 passing of the Chinese Interim Provisions on Traceability Management of Power Battery Recycling in New Energy Vehicles, see: *https://www.gov.cn/xinwen/2018-02/26/content_5268875.htm*. For more information on digital battery passports, see the World Economic Forum Briefing paper (June 2023) "Digital Battery Passports: an enabler for sustainable and circular battery management", available at *https://www3.weforum.org/docs/WEF_Digital_Battery_Passport_2023.pdf*.

4 See the USA Inflation Reduction Act of 2022, available at *https://www.congress.gov/bill/117th-congress/house-bill/5376/text* and the World Economic Forum, Briefing paper (ibid).

8. It is important to mention that while DPPs promise to deliver significant benefits, every effort need to be made to ensure that such initiatives do not turn into barriers to trade, especially for emerging economies. Capacity building and technical assistance will be paramount to ensure best possible sustainable development outcomes.

9. This document aims to do the following:

    • Describe why ECE-UN/CEFACT standards and tools are relevant to DPP development;

    • Explain which current and emerging ECE-UN/CEFACT standards and tools can support the development of DPPs, notably the traceability and transparency standards; and

    • Provide specific recommendations for how ECE-UN/CEFACT standards and tools could be further developed to support DPPs.

II. Why are ECE-UN/CEFACT standards and tools relevant to Digital Product Passports

10. Designing and implementing data sharing within global value chains through a DPP requires standardized data that is structured based on open standards for machine readable, structured and searchable content, as well as open standards for the interoperable exchange of that data. This facilitates the creation of trustworthy information and authentication by different systems.

11. The following are ways in which ECE-UN/CEFACT standards and tools directly support the development of DPPs and, thus, globally sustainable and digitally facilitated trade:

    • **ECE-UN/CEFACT standards are global** and trade is global. This is especially relevant for ECE member States who represent over 50 per cent of world trade in goods and 65 per cent in services respectively (UNCTADstat 2022[5]). A successful DPP, therefore, needs to embed a global dimension.

    • **ECE-UN/CEFACT is one of four global international standardization bodies** that are signatories of the 2000 Memorandum of Understanding on Electronic Business. The others are ITU[6], ISO[7], and IEC[8].

    • **ECE-UN/CEFACT standards are open, transparently governed and royalty free**. They consist of data structures that are designed with small- and medium-sized enterprises (SMEs) in mind and are made available to users and beneficiaries free of charge.

    • **ECE-UN/CEFACT data components can be used across industries, countries and regions**. Some standards may be "locked in" sectoral, regional or country specific semantics and requirements; however, UN/CEFACT standards are widely applicable, based on the use of harmonized codes.

        a. While some data, such as street addresses, may need to be given in a "free text" format, much data, if not the majority, can be provided using codes. UN/CEFACT standards do this by first indicating for a data component which code list is being used and then providing a code from that list.

        b. This means that it is possible to use existing code lists, developed and maintained by international, regional, national and sectoral organizations.

        c. As a result, UN/CEFACT standards can be applied across different industries and jurisdictions by simply changing the code lists being referenced, allowing the data exchange structure to remain unchanged.

    • **ECE-UN/CEFACT standards are interoperable**. While some standards represent data using free text, the codes lists used in UN/CEFACT standards enable machine processing because the data is defined and comparable (i.e. it is always assigned the same meaning) and can be exchanged and processed across data management systems that implement the same codes.

    • **ECE-UN/CEFACT standards support sustainable development**. ECE-UN/CEFACT work is aligned with the United Nations 2030 Agenda for Sustainable Development and contributes to the United Nations Sustainable Development Goals. An example includes its standards for the exchange of traceability and transparency information for sustainable and circular value chains and cross-border green and digital trade.

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5   UNCTAD, Handbook of Statistics 2022, available at *https://unctad.org/publication/handbook-statistics-2022*.

6   International Telecommunication Union - *https://www.itu.int/en/Pages/default.aspx*

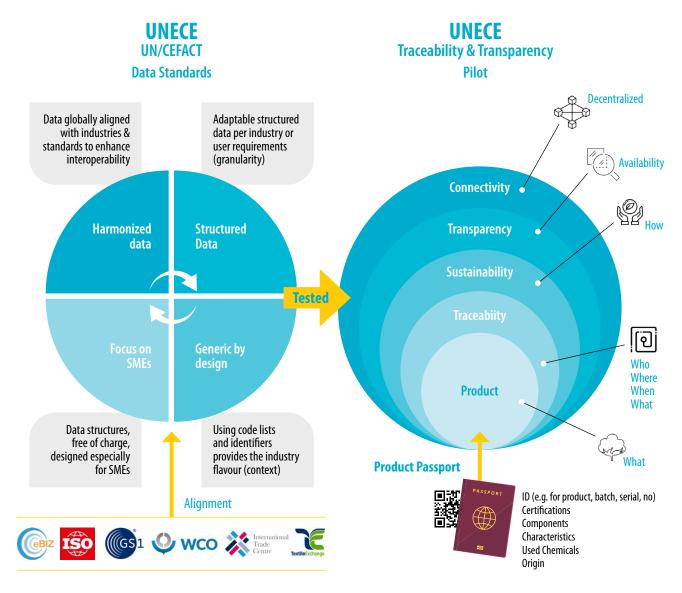7   International Organization for Standardization - *https://www.iso.org/home.html*

8   International Electrotechnical Commission - *https://www.iec.ch/homepage*

- **ECE-UN/CEFACT is driven by a global community of experts and standards development organizations** from both the public and private sectors. This community cooperates to achieve common goals – namely interoperability of processes, data and code lists for data exchange. Participation in this work is free of charge and open to all experts who are approved by their Head of Delegation to UN/CEFACT, or their government, or their country's Permanent Mission to the United Nations.

12. A successful DPP will rely on digital, harmonized data and information exchange. Value chains are global, so the data and information exchange required for DPPs must be globally and electronically usable and understandable for both businesses and governments – a core objective of UN/CEFACT work.

13. ECE-UN/CEFACT standards are aligned with the general requirements for DPPs. The figure below illustrates how such general requirements relate to the ECE-UN/CEFACT traceability and transparency standard implementation.

FIGURE 1

Alignment of ECE-UN/CEFACT standards with general requirements for DPPs and traceability and transparency value chains

Source: ECE-UNCEFACT, 2023

III. The ECE-UN/CEFACT standards and tools relevant to Digital Product Passport

14. Existing ECE-UN/CEFACT standards and tools that support the development of DPPs include the traceability and transparency standards for electronic information exchange in value chains, the international value chain reference data models, web vocabularies (JSON-LD), and guidance on verifiable credentials for cross-border trade.

15. New and ongoing UN/CEFACT projects that are relevant include work on traceability and transparency in the textiles and leather sectors, product data exchange for circularity, sustainability and resilience of value chains in the critical raw materials sector.

UN/CEFACT standards and tools	Relevance to DPPs
The United Nations traceability and transparency standards package consists of the following: • **Business Requirements Specifications** for Traceability and Transparency in the Textile and Leather Sector, Part 1: High-Level Process and Data Model, and Part 2: Use Cases and CCBDA Data Structures • Textile and Leather Data Model **Traceability and Transparency Context CCL** (accessible here > Key documents > Standard) • **Product Transparency Message** (accessible here > Key documents > Standard) • **Product Traceability Event Message** (accessible here > Key documents > Standard) • **Business Process Analysis for Sustainability and Circularity** in Textile Value Chains and in the Leather Value Chains	These publications provide a well-tested set of semantic standards for the processes and data relating to the sustainable textile and leather supply chains. The standards include the traceability event data structures and industry semantics that provide for visibility across the entire supply chain, from primary materials production to finished product. The standards have been implemented and tested via industry pilot projects that included multiple brands, manufacturers, certifiers, and producing countries from all regions of the world (20 use cases for clothing products, involving 90 industry actors from 23 countries).
ISO fast-tracked UN/CEFACT International Supply Chain Reference Data Model (Buy-Ship-Pay) • ISO Technical Committee (TC) 154 approved the fast-tracking of the ECE-UN/CEFACT Buy-Ship-Pay Reference Data Model as a new ISO standard (ISO 20197 Buy-Ship-Pay Reference Data Model)	The standard is a reference data model and is highly relevant to DPPs as its semantics support sustainable development and product circularity and related business models. It includes the traceability and transparency standards package described above. It is in the process of being approved as an ISO standard.
UN/CEFACT White Paper: eDATA Verifiable Credentials for Cross Border Trade, includes the following: • A business and technology overview of a highly scalable decentralized architecture for trusted data exchange; and • A suite of use cases, including for product conformity and textile supply chain traceability.	The White Paper is very well aligned with the requirements for implementing a decentralized architecture for DPPs. It provides guidance that can be used for the privacy, integrity, security, trust and scalability aspects of a DPP implementation.

UN/CEFACT standards and tools	Relevance to DPPs
UN/CEFACT Web Vocabularies (JSON-LD): • Final draft: UN/CEFACT Buy Ship Pay (BSP) Reference Data Model and all associated Code Lists.	Verifiable credentials require JSON-LD context references and so publication of these established UN/CEFACT semantics as JSON-LD, which will allow DPPs to use them in verifiable credential implementation.
Project: The UN/CEFACT Product Circularity Data Standard[9] In line with the ECE traceability and transparency project, ECE-UN/CEFACT started a project to develop a standard for product circularity data in 2023. The aim of the standard is to improve the circular performance of products through the exchange of product data linked to a digital identity, which supports circular business models (i.e. resale, rental, collecting, sorting, recycling). The ECE-UN/CEFACT product circularity data model is being designed in a generic manner to ensure applicability to all main textile and leather materials and products, and to be global in its scope. It will be part of the UN/CEFACT Buy-Ship-Pay model, which covers all stages of the product life cycle in circular business models. It is expected that ECE-UN/CEFACT will adopt and publish this standard in early 2024.	The project aims at developing the ECE-UN/CEFACT Product Circularity Data Standard, which will be mapped to all the data requirements of the EU DPP, as defined in its Ecodesign Regulation. All countries participating in the work of ECE-UN/CEFACT, not just those in the EU, will benefit from data harmonization. Such project platform will promote cross-border trade and circular business regionally and globally.
Project: UN/CEFACT Critical Raw Materials Sustainability and Resilience Standard[10] • This new project will draw on both the textile and leather traceability and transparency standards and the verifiable credentials architecture and web vocabularies.	The project will demonstrate the reuse of UN/CEFACT cross-industry standards to support sustainability and resilience in the critical raw materials sector and for specific product groups, such as batteries.

Source: ECE-UN/CEFACT, 2023

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9   The UN/CEFACT product circularity data standard project webpage: *https://uncefact.unece.org/display/uncefactpublic/ EXTENSION+TEXTILE+AND+LEATHER+BRS+PART+2%3A+Use+case+and+CCBDA+data+structure+supporting+product+circularity*.

10   The UN/CEFACT Critical Minerals Traceability and Sustainability project webpage: *https://uncefact.unece.org/display/uncefactpublic/ Critical+Minerals+Traceability+and+Sustainability*.

IV. Recommendations for action

16. ECE-UN/CEFACT is a key partner to international and regional institutions – such as IEC, ISO, ITU11 and the European Commission (EC) – for the development of standards in the field of sustainable and digital cross-border trade, transport, logistics and value chain management.

17. ECE-UN/CEFACT offers a multistakeholder global platform for coordinating efforts on the development of DPPs, building on existing best practices and ensuring alignment and coherence across multiple jurisdictions.

18. Based on the above, UN/CEFACT could consider developing:

   • A United Nations/Model DPP based on existing UN/CEFACT data models and standards for B2B, B2C and B2G information exchange in global value chains, taking into consideration needs of all implementing actors, particularly in emerging economies.

   • Implementation guidelines for the use of existing UN/CEFACT standards for DPPs.

   • Generic examples based on real life DPP proposals to show how UN/CEFACT standards can be implemented in DPPs across sectors and jurisdictions.

19. This would involve the following actions:

   • With a view of enhancing interoperability, *map a United Nations/Model DPP system and data model to planned DPP systems and data models* (including the planned EU DPP) and relevant standards developed within the framework of international standardization organizations such as those by UN/CEFACT and ISO [12].

   • With a view of maximizing the use of existing standards, *promote the cross-referencing to relevant UN/CEFACT standards in regulations and implementation guidelines for emerging DPPs being developed under various jurisdictions.*

   a. For example, 18 UN/CEFACT standards have already been listed in the 2023 Report of the EU Technical Working Group on DDP: Landscape of DPP Standards as reference standards for the EU DPP.

   b. In particular, promote the cross-referencing of UN/CEFACT Traceability and Transparency package of standards for textile and leather value chains, given that it has already been proven in large-scale, global pilots that have established end-to-end traceability. This package of standards was developed with support of the European Commission (DG INTPA), international standards setting bodies and industry actors.

V. ECE-UN/CEFACT references

   • The ECE-UN/CEFACT website: https://unece.org/trade/uncefact

   • The ECE Traceability for Sustainable Garment and Footwear project webpage: https://unece.org/trade/traceability-sustainable-garment-and-footwear

   • The Sustainability Pledge website: https://thesustainabilitypledge.org/

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11 A Memorandum of Understanding (MoU) had been established between IEC, ISO, ITU and UNECE concerning standardization in the field of electronic business: *MoU E-Business Oct 02.PDF (unece.org)*

12 See *Directive 2014/55/EU* of the European Parliament and of the Council of 16 April 2014 on electronic invoicing in public procurement, para (19).

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