

Büchel, Jan; Neligan, Adriana

Article

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Jan Büchel and Adriana Neligan

Digital Product Passport: Finding the Right Balance Between Transparency for Circularity and Added Red Tape

The European Union is introducing Digital Product Passports (DPPs) to pave the way for a low-carbon and sustainable circular economy. The aim of this digital tool is to provide product-relevant data transparently to all stakeholders involved. The DPP offers many chances, but also challenges and implementation barriers. This paper contributes to the debate on DPPs by presenting results of a recent company survey in Germany conducted by the German Economic Institute (IW). Since many German firms are not yet familiar with or ready for the DPP, a practicable cross-sectoral implementation solution is needed.

Necessity of Digital Product Passports

The transition to a circular economy is a key pillar of the European Green Deal, the European strategy for climate-friendly growth. The aim of a circular economy is to consume fewer resources, use them several times or replace them entirely with more climate-friendly alternatives. The necessary view on the entire product life cycle requires knowledge of both the upstream stages and the effects of one's own actions on downstream stages of the value chain (Neligan et al., 2023). Hence, the various players along the value chain are required to communicate efficiently – and therefore automatically – via interfaces. Digital data is needed to measure and evaluate the success of circular material flows and business models. One solution is the planned DPP to make product data on materials, properties, repair and disposal options available transparently and efficiently to all stakeholders in the product life cycle (Neligan, 2025).

Various product-related regulations such as the EU Battery Regulation or the EU Ecodesign for Sustainable Products Regulation (ESPR) specify DPPs. The first DPP for batteries is due to be introduced in 2027. The EU Commission outlined in April 2025 a rollout for further DPPs in its Working Plan for the EU Ecodesign Regulation until 2030. This plan sets out the sequence of product groups for which delegated acts containing new ecodesign product requirements, e.g. reparability and recyclability, will be adopted. Delegated acts are now scheduled for steel and iron in 2026, for textiles, aluminium and tyres in 2027, for furniture in 2028 and for mattresses in 2029. Ultimately, the EU Ecodesign Regulation will introduce new product requirements for product groups in almost every sector. In addition, every product with ecodesign requirements will have a DPP unless there is an alternative digital system offering equivalent information, for example, the European Product Registry for Energy Labelling (EPREL) database for energy-related products carrying an energy label (European Commission, 2025a). Despite the current efforts of the European Commission to simplify its sustainability reporting obligations, the proposal of the first EU Omnibus package on sustainability in February 2025 did not address the EU Ecodesign Regulation (European Commission, 2025b). Hence, the introduction of DPPs is to take place as scheduled. This makes it necessary for companies to share, digitally process and add relevant product information to DPPs in the future.

Technical requirements for implementing Digital Product Passports

The realisation of a DPP is complex. The DPP must record and structure all product-specific information required from a regulatory perspective, including that of preliminary products. The amount of information to be processed in a DPP increases the more components a product contains. The transfer of information between companies and/or different systems within companies only works if the individual DPPs are compatible or interoperable. This requires a structured and, above all, standardised collection and transfer of information. All stakeholders involved need to be able to view and add necessary product-specific information according to their authorisation levels (Neligan et al., 2023). A DPP must be filled in on the initiative of the company that manufactures a product. At a later stage, however, other stakeholders such as in-

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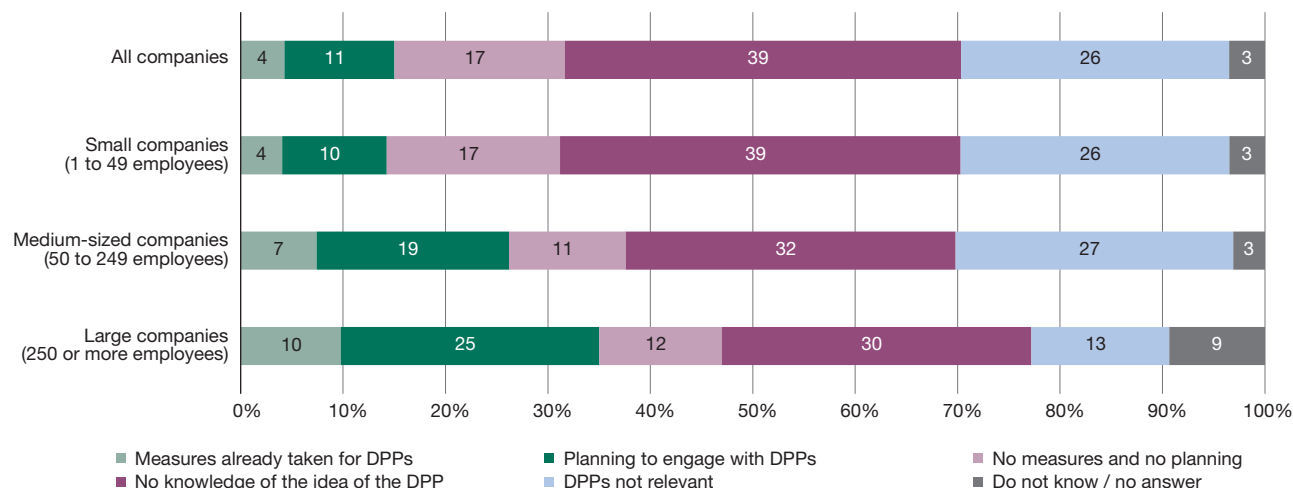
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Jan Büchel, German Economic Institute (IW), Cologne, Germany.

Adriana Neligan, German Economic Institute (IW), Berlin, Germany.

Figure 1
Preparedness for Digital Product Passports

Percent of German companies, 2024



Notes: Question: Has your company already taken measures to prepare for the introduction of digital product passports? Sectors included: industry, construction and industrial service providers. N=1,078.

Source: IW-Zukunftspanel, survey wave 49.

dustrial service providers can also add product-specific information according to their authorisation level, for example, if repair services are required and accomplished.

Companies therefore need the technical requirements to be able to issue, use and amend DPPs themselves. This means, for example, that product-specific information should be available in digital form. It requires two essential components – especially for companies at downstream stages of the value chain. On the one hand, data on the upstream products should be available. This requirement can only be influenced to a limited extent, as it depends on the way in which suppliers provide product-specific data. On the other hand, companies themselves should be able to process the received product-specific data in a structured way. They should also collect and process data for their own products. This allows companies to effectively combine received data with their own production or product data and therefore to issue DPPs themselves. However, company surveys from 2021 to 2023 show that only one in three companies in Germany is currently able to manage data efficiently (Bakalis & Büchel, 2024). This includes the extensive digital storage, structured processing and versatile utilisation of data. Conversely, this result means that two thirds of companies could have difficulties in processing product-specific data efficiently and making it available digitally themselves. For example, companies may receive product-specific data in a format

that they do not support, making it difficult to process the data further. On a positive note, however, around two thirds of German companies already store product data digitally (Berg et al., 2024).

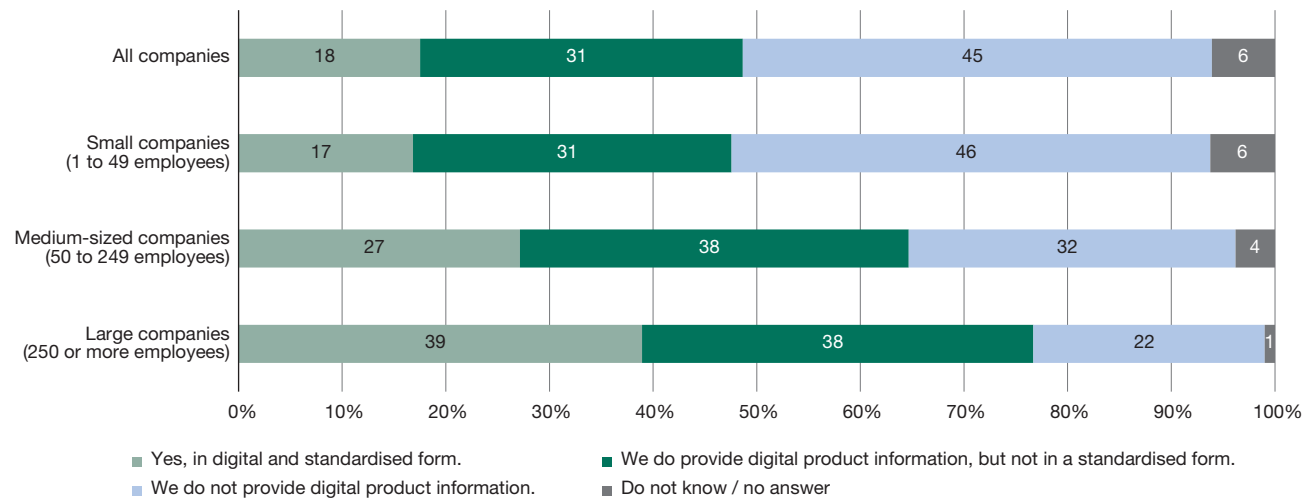
DPP readiness of German firms

Although DPPs will soon become mandatory, the idea of DPPs is still largely unknown to German companies (Büchel & Neligan, 2025). This finding is the result of a survey of 1,078 companies that took place in autumn 2024 as part of the IW-Zukunftspanel, a regular representative survey among business leaders in industry, construction and industrial service providers, e.g. wholesale, logistics, information and communication technology (ICT) and other industry-related services. The responses are weighed representatively based on the German statistical business register (*Unternehmensregister*) to correct for possible size and sectoral effects.

Two thirds of the companies surveyed were not aware of DPPs (38%) or do not consider them to be relevant (27%) (Figure 1). Only 4% have already taken measures to prepare for the introduction of DPPs, while a further 11% are planning to engage with DPPs. Additionally, 17% of companies are aware of DPPs, but do not specifically deal with them nor do they plan to do so in the future. It is possible that the benefits of DPPs are not yet clear enough to

Figure 2
Sharing product-specific data with other companies

Percent of German companies, 2024



Notes: Question: Does your company already provide customers, suppliers or other partners with product information in digital and standardised form? Sectors included: industry, construction and industrial service providers. N=1,078.

Source: IW-Zukunftspanel, survey wave 49.

these companies or that they are waiting for technical solutions to mature. A further barrier might be regulatory uncertainty concerning the technical requirements of DPPs.

Preparedness for DPPs increases with company size: 35% of companies with more than 250 employees have already taken measures or are preparing for them. Among medium-sized companies with 50 to 249 employees, the share is 26%, while among small companies with fewer than 50 employees, it is 14%. Around one in four small and medium-sized companies do not consider DPPs relevant, compared to only 13% of large companies. One factor could be that large companies typically have more personnel capacity to deal intensively with upcoming regulatory requirements. More companies in the basic materials industry are working on DPPs or are planning to do so (19%). This is important because these companies play a central role in the success of DPPs: the basic materials industry generally contributes to the first stages of supply chains. If essential product data is already digitally stored and shared at the beginning, it is easier for customers at later stages of the value chain to recognise and process product-specific data. It is striking that only two thirds of industrial service providers consider DPPs relevant to their business model. This could be due to an (ongoing) lack of realisation that DPPs will affect the entire product life cycle and therefore potentially also their services during and after the usage phase of a product.

Standardised digital product information is imperative for the success of DPPs, but the reality is different: only around half of the companies surveyed in industry and industrial service providers in Germany offer digital product-specific data to their customers, suppliers or other partners, and only 18% of these do so in a standardised form (Figure 2).

Large companies are significantly more advanced: while three quarters of German companies with more than 250 employees share digital product data (39% standardised), two thirds of companies with 50 to 249 employees do so (27% standardised) and only just under one in two companies with fewer than 50 employees (17% standardised). This overlaps with surveys showing that large companies in Germany are more advanced in terms of digitalisation (Büchel et al., 2025) and data economy readiness (Bakalis & Büchel, 2024). This poses additional challenges, particularly for small and medium-sized companies, to meet the technical requirements of DPPs.

In the manufacturing sector, three out of five companies provide product-specific data to others – 24% of them in a standardised form. Firms that already share product-specific data are more likely to be prepared for the DPP: one in four of these data-sharing companies is preparing for the DPP or plans to do so in the future (without product-specific data sharing: 7%). Overall, only 21% of

companies that share digital product data do not consider DPPs as relevant, compared to 33% of companies that do not share product-specific data. Apparently, German firms that have realised the benefits of DPPs have already taken the initiative to share their product-specific data with other companies. Initial positive experience with the benefits of data sharing could also encourage companies to be more open to other data sharing concepts such as the DPP.

Advantages and challenges of DPPs

The DPP is an important enabler, as it provides the necessary data and networking opportunities to set the course for a circular economy. The aim of the DPP is to ensure better transparency along the industrial value chain by digitally storing product-specific information (Neligan et al., 2023). However, the DPP as such does not ensure lower environmental impacts from products. These depend primarily on their design and the choice of materials (European Court of Auditors, 2023).

DPPs are not yet an issue for many companies due to a lack of regulatory requirements regarding their specific implementation. As a result, there are major information gaps among companies about the associated advantages and challenges of DPPs. Yet, from a macro perspective, the DPP can bring further far-reaching benefits by improving market transparency, increasing efficiency, enabling new business models and offering greater product and counterfeit protection (Deloitte, 2022).

From a business perspective, the net benefit of a DPP will strongly depend on the implementation costs. Manufacturers are the primary source of information for DPPs, and therefore they should perceive a DPP approach as a benefit rather than a burden (Neligan et al., 2023). On the one hand, DPPs require data with detailed information on products and supply chains. Hence, setting up DPPs may be costly and time-consuming from a corporate perspective, especially for small and medium-sized companies with digital backlogs. Due to the potentially high cost of data provision, there is a risk that the costs will be higher than the expected business benefits associated with the DPP (Adisorn et al., 2021). In addition, to avoid the risk of unintended disclosure of business secrets, data security and data protection must be ensured, as a DPP can be linked to sensitive product information (Neligan et al., 2023).

At the same time, DPPs will also increase the standardisation and digitalisation of product data which can lead to time and cost savings in the medium to long term. Being a fully digitalised and standardised system, the DPP will offer the chance to speed up data storage, processing

and use in internal processes, e.g. production, and cross-company processes, e.g. procurement. However, a main implementation barrier is that many companies still need to catch up to fulfil the digital requirements necessary for the DPP. This can have both positive and negative implications. It puts additional pressure on companies that are still in the early stages of managing their data. At the same time, the requirement to provide DPPs may create additional incentives for companies to strengthen their digitalisation and data sharing activities. Overall, the data economy in the EU could therefore benefit from this.

On the other hand, the increased transparency along the industrial value chain and product life cycle as well as new networking possibilities offer efficiency gains, improved sustainable supply chain management, better risk management and new business opportunities such as the development of digital business models in the sense of a “product as a service” (Neligan et al., 2023). DPPs will increase the visibility of a product’s entire value chain. This helps to optimise processes and to reduce the negative environmental impact of a product. Furthermore, risks can be more easily and more quickly identified with the available detailed and shared data of a product.

The increased quantity and quality of product data provided by DPPs can also improve product quality and ensure product safety more easily. Product quality can also be better communicated to customers via DPPs enabling sustainable consumption choices. In addition, standardised data in DPPs can facilitate mandatory reporting. The increased transparency can also make it easier for firms to adhere to sustainable business practices.

The EU Ecodesign Regulation primarily affects companies that operate in the EU. However, supply chains can be complex and multi-layered, meaning that companies outside the EU can be involved in the manufacturing of preliminary products, which are imported, for example. European companies at later stages of the value chain therefore also depend on digital product data from these suppliers to be able to fully complete DPPs. Furthermore, non-EU companies will also need to have DPPs if they want to sell products regulated by the EU Ecodesign Regulation in the European Union. Consequently, indirect effects or certain requirements for companies outside the EU can emerge. Similar discussions are already taking place in the context of the EU Corporate Sustainability Due Diligence Directive (CSDDD). If this means additional costs for non-EU suppliers to provide product-specific information, these companies could have an incentive to sell their products primarily to customers outside the EU to circumvent this regulation. If the market situation and individual negotiating power allow, this could affect

the competitiveness of European companies. If not, a pull effect on non-European suppliers could emerge to drive their digitalisation. This could lead to a situation in which these companies benefit overall from the advantages of increased product transparency and thus can contribute to more sustainability. Ultimately, in a globalised world economy, a DPP information system can only work globally. Yet, it is more likely that there will be different DPP systems besides the EU solution. The main prerequisite will be that they are interoperable in order to avoid fragmentation and market exclusion.

The fact that up until now there is no concrete proposal for the implementation of a DPP makes its preparation more difficult. Given the low DPP readiness of firms, it is essential that the European Commission develops a cross-sector solution for a DPP that can be implemented by as many companies as possible. Existing global open data standards that companies are familiar with could be an important basis for this.

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