文藻歐盟園區電子報

Wenzao Europe Newsletter

April 2021

155

ISSN: 2708-5864

Digital Product Passports for a Low-Carbon Circular Economy?

Armin Ibitz, Ph.D.[1]

While climate change continues unabated, the large share of global emissions from material management moves into the spotlight of discussions. As of now, material management accounts for about two-thirds of global greenhouse gas emissions. To achieve the transformation into a carbon-neutral European economy by 2050, a rapid transition towards a circular economy is unavoidable (Digitaleurope, 2019). In the European Union's Green Deal (EC, 2019) as well as in its Circular Economy Action Plan (EC, 2020), there is increased impetus to focus on product policy to promote decarbonization efforts. Digitalization plays a major role in this transformation process, as it serves as a major technology to overcome information deficiencies. The establishment of a circular economy requires the availability of comprehensive data sets and the flow and exchange of information along the entire value chain (Wilts and Berg, 2018). Several European countries are at the forefront of transforming into a low-carbon circular economy (e.g., the Netherlands, UK, and Denmark). Recently, Germany stepped up its efforts to accelerate its transformation. When the German government presented its Digital Policy Agenda for the Environment in March 2020, it aimed at utilizing digitalization for gaining environmental benefits and supporting climate action (BMU, 2020). Among the 70 proposed measures, the introduction of a digital product passport represents an intensely debated one.

[1] Associate Professor at the Graduate Institute of European Studies, Wenzao Ursuline University of Languages, Kaohsiung; Director of Wenzao EU Center.

What is a Digital Product Passport?

A digital product passport is a digital representation (digital twin[2]) of a physical product, storing relevant information, from production, distribution, operation to recycling. It combines a unique product identifier and data collected by actors along the value chain. The passport includes information on all product's components, materials, and chemical substances. Additionally, it contains relevant information on reparability, parts replacement, and proper disposal (see Figure 1).

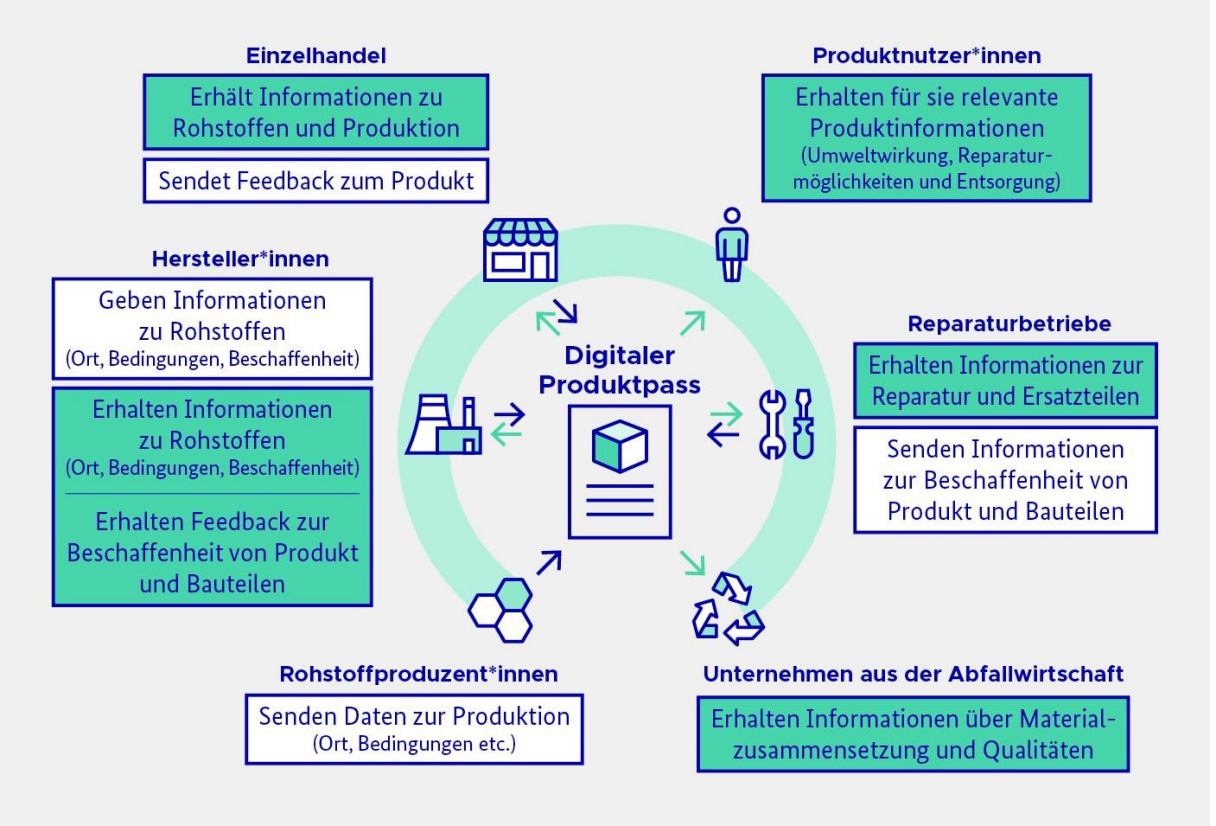
How does a Digital Product Passport result in emission reduction?

One of the core problems of the decarbonization of our economy is the lack of information about the ecological footprints of products and services. The digital product passport aims to fill this gap by serving as a central place for all the information needed about the product. To make it efficient, the contained data must include information from all stages of the product life cycle: from raw material mining, design, manufacturing to recycling.

With the deployment of digital technologies, data generation and access across the product´s life cycle can be realized. Since the lack of information along the lifespan of products increases material mismanagement and causes emissions, the passport plays a key part in removing inefficiencies but also increasing transparency along the value chain. Transparency should provide benefits to all involved. Consumers often do not have access to verifiable information on the environmental impact of products. Those looking for detailed product information have to go through many different sources – as there is no central database collecting all information. With a digital product passport in place, a simple scan of a QR-code (put on a product) enables them to retrieve detailed information about the product immediately. The product passport enables consumers to make conscious and more environmentally friendly decisions based on all collected product information.

[2] A digital twin is a virtual model or replica of a real physical object. They are used to test new processes or modifications to predict outcome. By testing various options virtually before applying in real life, digital twins help to optimize systems or waste management.

Figure 1: How does a digital product passport work?



Source: BMU [3]

Until now, manufacturers do not share information about the contained materials in a product. Consequently, recycling companies struggle to adequately deal with discarded products or components. Information is not passed over for several reasons: Manufacturers see no need in handing over information to down-stream actors, they are not aware of the usefulness of the information for other actors or they do not have the information at hand. In some cases, they hesitate to provide information about contained substances and materials due to concerns about revealing corporate secrets. A competitor could conclude on production processes by analyzing the data thoroughly. However, this lack of information access hinders the development of a circular economy. For example, when recycling companies do not have full knowledge about all contained materials in discarded products, it leads

[3] https://www.bmu.de/digitalagenda/so-funktioniert/

to inefficiency and higher costs of recycling. With a product passport in place, they know more about the material composition in the discarded product and could improve recycling processes. As a result, they could provide secondary raw materials at lower prices while ensuring consistent quantity and quality.

Applicability of the Digital Product Passport

A passport is suitable for all products, services, and even food. However, it is particularly significant for resource- or energy-intensive products with highly complex material compositions. Such passports could be useful to include computer, communication devices, and electrical appliances, such as refrigerators or washing machines. All involved actors benefit from a product passport: In times of steadily increasing environmental awareness of consumers, it is in the interest of manufacturers to know where and under what conditions raw materials are mined. Repair companies require information on spare parts, such as for battery replacement in smartphones or electric vehicles. Recycling companies are in need of knowledge on the composition of products so they can recycle them more effectively, from laptops to washing machines. A product passport for rechargeable batteries could serve to expand the life of batteries and reduce the environmental impact of e-mobility. The packaging sector could also benefit from a product passport, as it could improve distinguishing between the kinds of plastics in the sorting plant.

Discussions around the Digital Product Passport

There is a vivid discussion on whether the product passport provides the promised benefits. Critics fear the product passport is not more than a bureaucratic hurdle which in extreme cases could reveal corporate knowledge. However, proponents see opportunities to create more transparency in materials and products.

Previously disposed material could find its way back into the economy, thus closing loops and increase circularity and lower emissions output.

Without doubt, the development of an efficient and secure product passport can only succeed in close coordination and cooperation with the industry (Götz et al, 2019). As of now, industry actors have several concerns: First, not all companies are ready to apply full digital technologies in their operations. However, only if all companies along the supply chain do possess the necessary digital infrastructure, the product passport works efficiently. Second, the introduction of the passport raises security concerns. Since the product passport consists of a large amount of data – including sensitive data – collected by different actors, data protection is a factor to consider. Consequently, the Digital Product Passport must be based on decentralized identity technology: To overcome this challenge, every product receives a unique identifier. Companies create a digital identity for each of their product to make them uniquely identifiable. If needed, the identity can be enriched with data from a wide variety of sources. In certain cases, it is useful that third parties can contribute or edit information. However, such access rights need to be granted by the digital identity administrator. Data can then be either visible only to certain actors or people, or to everyone. Here, blockchain technology provides a meaningful tool on how to do ensure the immutability of data.

The Digital Product Passport would increase transparency to procurement processes and decisions could be made based on the provided information in all product life cycles, such as redesigning products for better disassembly, easing the repair of products, promoting refurbishment, or improving recycling efforts. Of course, this requires a standardized data structure and comparable format to allow all stakeholders in the chain to work together. At the same time, the passport must include strong protection measures as it contains sensitive data that would allow conclusions about production processes. The use of digital technologies enables the

creation of a larger dataset of all products. Proponents argue that economic actors, as well as the public, receive more information about the circularity of products, thus promoting circular loops by re-using, sharing, repairing, refurbishing, recycling) and consequently reducing material usage and lowering emissions output. However, increased deployment of digital devices also increases energy consumption and thrives material demand. Through the launch of pilot projects, we could learn more about the real environmental impacts of such measures. Clear frameworks are needed to ensure that digitalization does not accelerate environmental degradation or result in massive data leakage (EPC, 2020). Applied thoughtfully, digitalization has huge potentials to contribute to climate action and increase the circularity of our economy.

Outlook

Climate change is one of the most urgent issues of this Century. Since material management contributes massively to greenhouse gas emissions, a digital product passport could provide one path to reduce emissions in the sector and increase the circularity of material flow in the economy. However, the proposed measure needs to prove its efficiency. In Germany, a final decision on the design and timeframe of a digital product passport is not made yet. In the consultation phase, various actors laid out their perspectives. However, the German government seems determined to implement the measure and receives support from the EU[4]. The Union considers the implementation of a digital product passport at the EU-level.

[4] https://digital-strategy.ec.europa.eu/en/news/eu-countries-commit-leading-green-digital-transformation

References

Berg H., K. Le Blévennec, E. Kristoffersen, B. Strée, A. Witomski (CEA), N. Stein, T. Bastein, S. Ramesohl, K. Vrancken. 2020. *Digital circular economy a cornerstone of a sustainable European industry transformation.* https://www.gstic.org/inspiration/how-to-transition-to-a-digital-circular-economy/.

BMU (Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit). 2020. *Digital Policy Agenda for the Environment*, https://www.bmu.de/en/digital-policy-agenda-for-the-environment/.

Digitaleurope. 2019. *Digitalisation as key for a sustainable Europe*. https://www.digitaleurope.org/wp/wp-content /uploads/2019/06/Narrative_ Sustainability_0620_WEB.pdf.

EC (European Commission). 2019. *A European Green Deal*. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en.

EC (European Commission). 2020. *Circular Economy Action Plan*. https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf.

EPC (European Policy Centre). 2020. *Towards a green, competitive and resilient EU economy: How can digitalisation help?*, https://wms.flexious.be/editor/plugins/imagemanager/content/2140/PDF/2020/Towards_a_green_competitive_and_resilient_EU_economy.pdf.

Götz, T., T. Adisorn, L. Tholen. 2021. *Der Digitale Produktpass als Politik-Konzept: Kurzstudie im Rahmen der Umweltpolitischen Digitalagenda des Bundesministeriums für Umwelt, Naturschutz und nukleare Sicherheit (BMU).* https://epub.wupperinst.org/files/7694 /WR20.pdf.

Wilts, C. H., & Berg, H. (2018). *The digital circular economy: can the digital transformation pave the way for resource-efficient materials cycles?* Wuppertal Institute.