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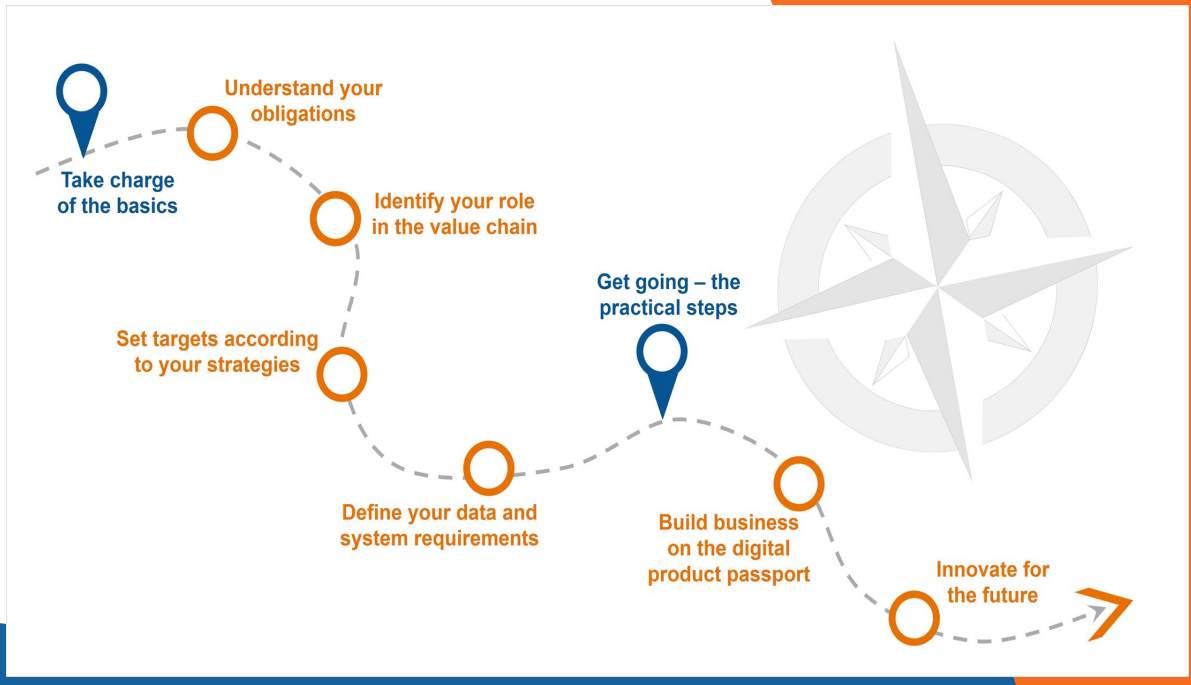

Implementing the digital product passport - A guidebook for businesses

Jaana Keränen | Inka Orko | Kristiina Valtanen | Maria Åkerman

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Preface

The digital product passport (DPP) initiative is part of the European Eco Design Regulation (ESPR) and the Green Deal. The ESPR framework legislation entered into force on 18 July 2024 and requires increased visibility into a product's sustainability information. This includes information on safe use and disposal, origin, composition, and environmental impacts of the products, for example. The DPP will be mandatory for products manufactured in and imported into the EU, with a phased rollout schedule for different product groups.

The ESPR gives a general framework for the data content and DPPs, but the exact content and DPP implementation will be defined in additional delegated acts as the result of the work of product-specific working groups. Products in textiles, batteries, steel and iron, and electronics will be among the first to provide the DPP under the ESPR and the Battery Regulation that passed in 2023.

The DPP requirements will impact product manufacturers and importers in many ways: they are expected to provide visibility to data that enables more sustainable product designs and use over the product life cycle, as well as new circular business models. New business opportunities are expected to emerge. On the other hand, the increased information demand will require planning, management and collaboration through the value network and will also take up resources, especially in the first implementation phases. For the data, data carrier, and system providers the DPP offers an obvious new business opportunity. The key issue for all stakeholders is to turn the DPP requirement into a business opportunity.

This guidebook will complement the other DPP publications available, with the emphasis on providing considerations and a practical roadmap for the implementation of the DPP. A key target group is the SMEs; the DPP system should provide an equal opportunity for all companies to contribute and utilise the DPP data, even if they run a small business or are startups or entering the market. Equally importantly, a collective understanding and shared goals are needed across the ecosystem including the DPP beneficiaries, product owners, data management service providers and system providers to build a coherent, reliable and relevant DPP system, and we also hope to contribute to this target.

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background document for the Digital Product Passport Playbook, also published by the project. The authors have utilised materials and feedback created for and in workshops and other FINNPASS events. We warmly thank everyone who has provided their valuable insights and contributions to the content. We also thank the FINNPASS project steering group for their support and contribution.

Welcome to the DPP implementation journey!

In Espoo, Tampere and Oulu, March 18th, 2025

Authors

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Vocabulary

blockchain	A distributed ledger with growing lists of records (blocks) that are securely linked together via cryptographic hashes.
circular economy	A model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible (the extended life cycle of products).
CPR	The Construction Products Regulation (EU 2024/3110) lays down harmonised rules for the marketing of construction products in the EU, enabling comparison of the performance of products from different manufacturers**.**
data carrier	A linear barcode symbol: a two-dimensional symbol or other automatic identification data capture medium that can be read by a device.
delegated act	An addition or amendment to the approved regulation, with product-specific supplements for the digital product passport, for example, regarding the content of information.
DPP	The digital product passport: a set of data specific to a product that contains the information specified in the applicable delegated act.
ecodesign	The integration of environmental sustainability considerations into the characteristics of a product and the processes taking place throughout the product's value chain.
ESPR	The Ecodesign for Sustainable Products Regulation (EU 2024/1781): the regulation includes requirements for the ecological design of sustainable products and the requirement to provide product information in the form of a digital product passport.
interoperability	The ability of computer systems or software to exchange and make use of information across the boundaries of the systems.

supply chain	All the upstream activities and processes of a product's value chain, up to the point where the product reaches the customer.
UPI	A unique product identifier: a specific code, such as a QR code or RFID tag, assigned to a product that links to its digital product passport. This identifier ensures that every product is traceable, and its data can be accessed easily at any point in its life cycle.
value chain	All activities and processes that are part of the life cycle of a product (including its possible remanufacturing).

1 Take charge of the basics

Ecodesign in general and the EU ESPR ecodesign regulation in particular aim at improving the durability, repairability, reusability, and recyclability of products, leading to extended life cycles for products and materials, and ultimately reducing the environmental impact and the need for new materials. The digital product passport (DPP) is an integral part of the regulation. In Finland, Energiavirasto and the Ministry of Economic Affairs and Employment are the responsible organisations for the EU processes and implementation in Finland.

The concept and basic requirements. A digital product passport (DPP) is a digital description of a physical product. The goal of the DPP is to extend the lifespan of products and promote their circular economy by providing useful product data.

The DPP will be required for products placed on or put into use in the EU market. If a product falls under the DPP legislation, the law mandates the implementation of the DPP. The size of the company does not affect this obligation. If a product does not meet the set requirements, it cannot be placed on the market or put into use within the EU.

The DPP can store information such as the product's technical performance, materials and their origins, repairability and recyclability, disposal guidance, and the environmental impacts through the life cycle. The data must be accurate, complete and up to date. The product information is required either for individual products, product models, or product batches, as will be specified in the product group-specific delegated acts (see the timeline in Figure 2). The DPP requires information from various phases of the product's value chain. The combined data from the different actors and data sources from the supply chain form the DPP data. For some products, also the users, second-hand operators and recyclers may be assigned a role as data providers for the DPP. Some of the DPP data will be made public, but access to some data content may be restricted and only available for specific data user groups.

The information in the DPP must be based on open standards, and it has to be interoperable, machine readable and transferable independent of the operator. Some user groups of the DPP, such as customers, must have free and easy access to the DPP. The DPP must be available for at least the expected lifetime of the product. The general principle is that when the characteristics of the product have changed, a new DPP must be created.

Reading the information may be done, for example, using a mobile application, through scanning a QR code, a radio-frequency identification (RFID) tag, a near-field communication (NFC) tag or another, similar data carrier attached to the product. Figure 1 shows how scanning the data carrier on the product with a mobile phone allows the DPP data to be read on the phone screen.

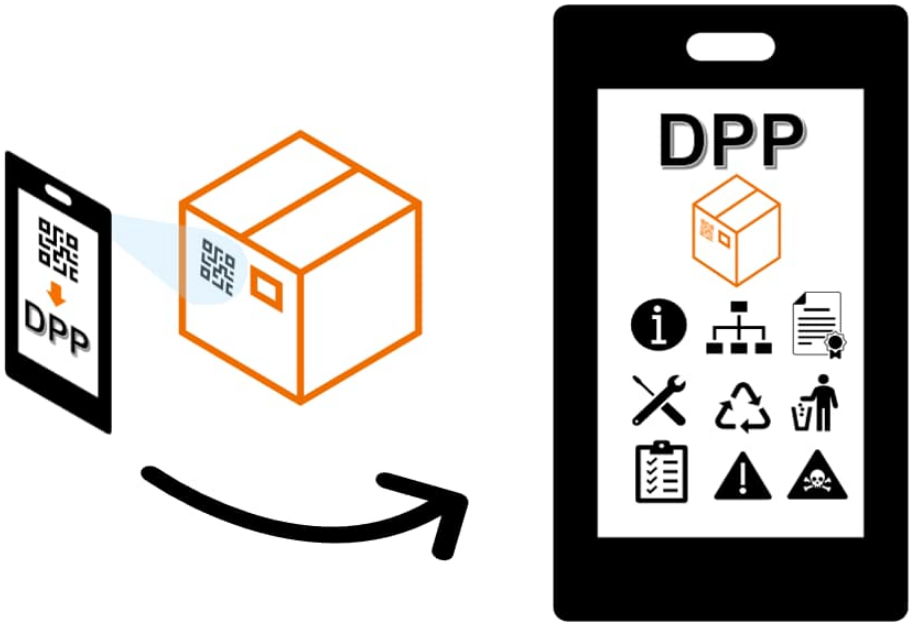

Figure 1. Reading the DPP data with a mobile phone. The code provides access to the DPP in the manufacturer's system.

The regulations and the product-specific delegated acts specifically guide the content requirements for a particular product or product group. Legislative work related to DPPs is progressing rapidly as the first DPPs should be in use by 2027. The DPPs will be required for specific product groups according to the timeline in Figure 2, and by the time, a large portion of products on the EU market will fall under the DPP legislation.

The timeline. The EU's ecodesign framework regulation (the Ecodesign for Sustainable products Regulation [ESPR]) entered into force on 18th July 2024. The goal of the regulation is to minimise the environmental impacts of products throughout their life cycle in the EU market. The European Commission has

prioritised the ESPR and DPP implementation order for the different product groups. According to the current understanding, the priority product groups are textiles (clothes); furniture; tyres; ICT products and other electricity and energy-related products; and intermediate products containing iron, steel and aluminium. The more detailed data and information content including performance will be issued through the delegated acts over the next few years.

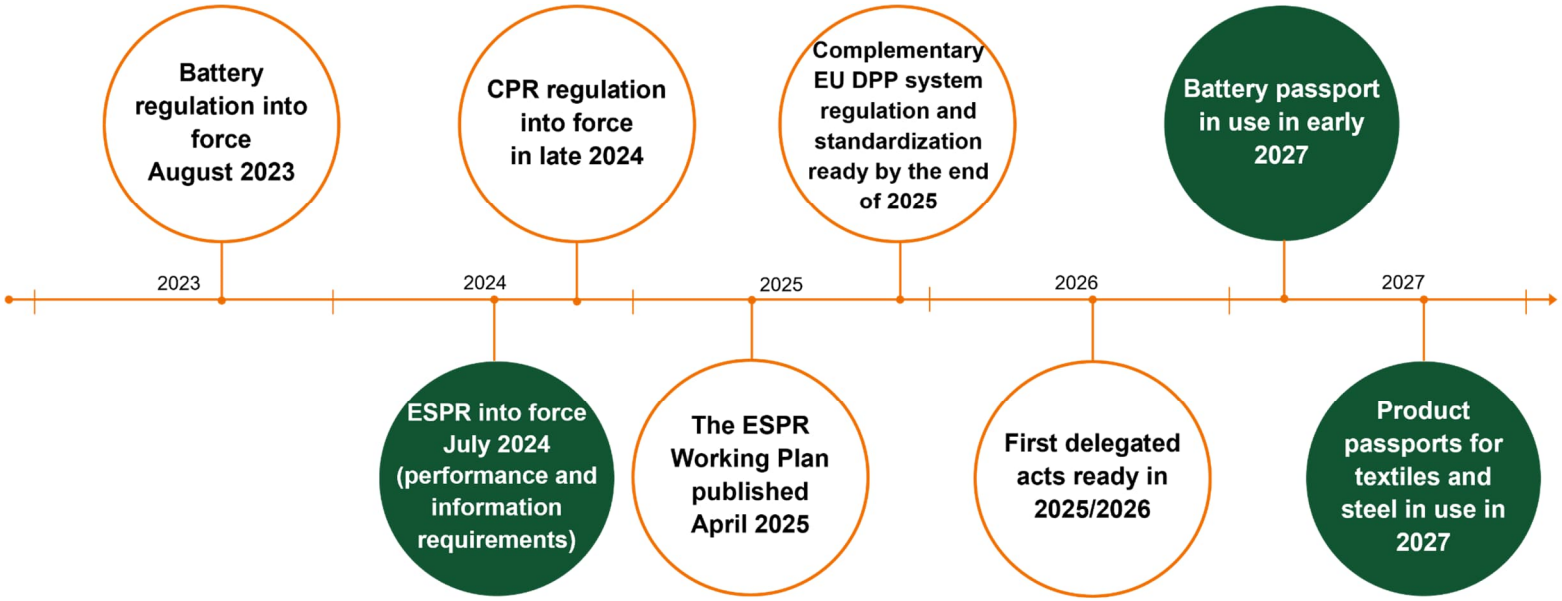

Figure 2. An estimate of the timeline for the implementation of the DPP (estimated in March 2025).

The battery regulation already entered into force in 2023 (see Figure 2). The battery regulation contains requirements for the battery passport for certain battery types (light means of transport batteries, industrial batteries with capacity greater than 2 kWh and electric vehicle batteries) and describes the information requirements for the battery passport. The Construction Products Regulation (CPR) lays down harmonised rules for the marketing of construction products in the EU. It came into force in late 2024. Manufacturers shall report on climate impact indicators for prioritised construction products (such as concrete, steel and insulation materials), and the DPP is the primary mean to report environmental information.

In spring 2025, the ESPR Working Plan is expected to be published by the European Commission. The Working Plan will confirm the working schedule for the delegated acts. The aim is to complete the regulation and standardisation work for the DPP by the end of 2025. The first delegated acts are expected to come into force in 2026. It is estimated that the first product groups for the delegated acts will be steel and iron and textiles.

The target of the commission is that the first DPPs will be introduced in 2027. The battery passport may be the first mandatory DPP in the market, and next the DPPs for textiles and iron and steel will be introduced.

The value and uses of the DPP. The DPP will offer value to users in the product's value network in many ways. It enables collection and sharing of information throughout the product's life cycle and improves the transparency and traceability of extensive product information. The DPP supports the circular economy and sustainable development by providing information on the recyclability and environmental impacts of the product. It also helps companies to comply with regulations and standards, reduces business risks, and enhances competitiveness in the market. Additionally, the DPP can create opportunities for companies to generate and implement new business models and services based on, e.g., better product data management.

With the help of DPP data, companies can optimise supply chain management, improve collaboration with subcontractors and customers, and develop new and more sustainable products and services. The DPP can open new market areas for current products. For consumers and other customers, the DPP offers transparency about the product data, enabling comparison between various products available on the market and more informed purchasing decisions.

Further information:

Finnish DPP demos: https://www.sitra.fi/hankkeet/digitaaliset-tuotepassit/

European demos for textiles, electrical and electronic equipment, construction products and tyres: https://cirpass2.eu/pa1-ioxio/

ESPR European Ecodesign regulation: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1781&qid=1729161437585

Official information on the Finnish ESPR implementation, sponsored by the Ministry of Economic Affairs and Employment: https://ekosuunnittelu.info/ekosuunnittelutietoa/digitaalinen-tuotepassi/

Support for and information on the circular economy in Finland, sponsored by the Ministry of the Environment: https://kiertotaloussuomi.fi/taito-ja-tyokalut/digitaaliset-ratkaisut/

Preparatory work and potential architectures for DPP implementation by CIRPASS – Digital Product Passport EU project: https://cirpassproject.eu/

2 Understand your obligations

The ESPR provides a framework for the ecological design of sustainable products and the DPP. For certain products there is also additional regulation, such as the Battery Regulation and Construction Products Regulation that also give a framework for the DPP. However, all regulation is expected to be synchronised.

The ESPR broadly applies to almost all product groups on the EU market. The regulation excludes food, feed, human and veterinary medicinal products, live plants, animals and micro-organisms, products of human origin, products of plant and animal origin related to their future reproduction, and vehicle product requirements. The requirements for these product groups are regulated elsewhere in EU regulation.

The ESPR is a framework directive and does not directly regulate the particular information requirements for the different product groups; this will be done in specific delegated acts. The European Commission is prioritising and scheduling the implementation order for these different product groups. The priority order has been set based on the sales volumes of the products (see Figure 3) and their climate and environmental impacts. The European Commission's three-year Working Plan confirms the preparation work for the DPP implementation. This work includes conducting an extensive preparatory study, examining products on the market and identifying potential areas for development. Product-specific information requirements will be formulated based on the preparatory study and comments received from the Ecodesign Forum, a special platform formed to facilitate market discussion and prepare the DPP. The Forum is open for interested participants for the preparation of the regulations for the individual product group, or through trade associations, member countries or other stakeholders.

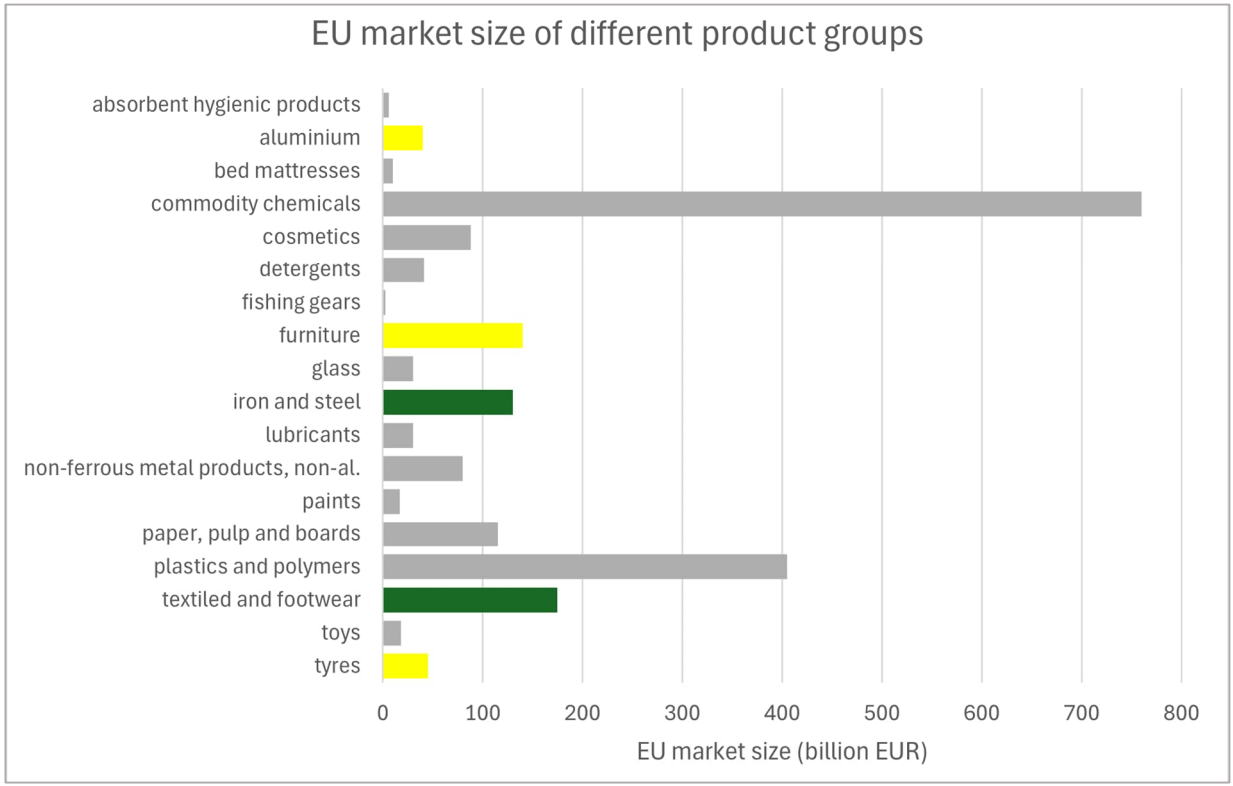

Figure 3. An estimate of the product market size in EU as one key criterium for product groups to be regulated; green product groups confirmed for the DPP, yellow product groups to follow. JRC 2024.

According to the current understanding, the DPP will first be required for batteries and textiles (such as clothing), and for iron and steel (estimated to be required in 2027). Currently, the next product groups to be regulated are expected to be aluminium, energy-related products, and ICT products and other electronics. The DPP requirement will apply to those products and intermediate products that have been placed on the EU market after the DPP requirement comes into force. The manufacturer, the manufacturer's representative or the importer to the EU market will be responsible for placing the DPP on the market.

Further information:

Background information for the product group specific regulative work. Joint Research Centre report: https://susproc.jrc.ec.europa.eu/product-bureau/product-groups/635/home

3 Identify your role in the value chain

The product value chain

Implementing the DPP requires information exchange between companies in the value chain (see Figure 4). Also, it is typical that raw material and intermediate product providers serve many sectors and value chains with different performance requirements and data conventions. EU standardisation of information requirements and data interfaces is ongoing and will help in streamlining the data management.

On the side of the physical product value chain, the DPP creates a data value chain formed by the DPP data stakeholders (see Figure 5). This value chain may include additional stakeholders, such as data solution providers, platform and other service providers, and data marketplaces.

A company responsible for providing a DPP (the DPP issuer) typically has a role both in the physical product's value chain and in the data value chain. They may also have a double role as both a data provider for other companies and as a data collector for their own use in relation to implementing the DPP. It is important for companies to identify which roles and responsibilities they may have in the different value chains they participate in.

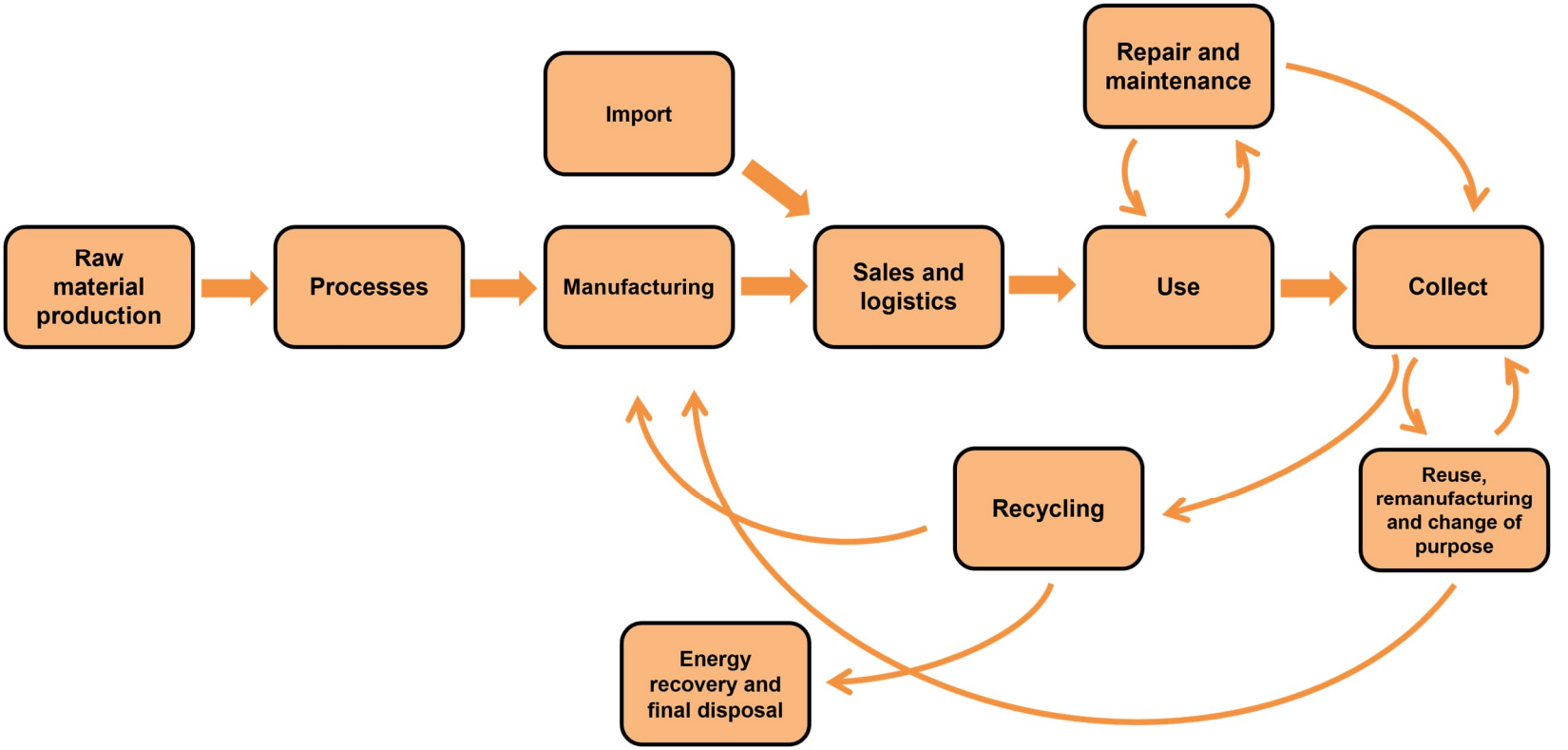

Figure 4. A typical product value chain.

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The role definitions and obligations in the DPP regulation

The ecodesign regulation ESPR also allocates formal responsibilities for the DPP actors in different roles. These main roles include the following:

- **The manufacturer** manufactures a product or has a product designed or manufactured and markets that product under their name or trademark (brand owner).
- **The importer** places a product from a third country on the EU market.
- **The distributor** makes a product available on the market (other than the manufacturer or the importer).
- **The dealer** offers products for sale, hire or hire purchase to end users during a commercial activity, including through distance selling.
- **The DPP service provider** is an independent third-party authorised by the economic operator which places the product on the market or puts it into service and the service provider processes the DPP data for that product in order to make such data available.
- **The professional repairer** provides professional repair or maintenance services for a product, irrespective of whether that person acts within the manufacturer's distribution system or independently.
- **The conformity assessment body** performs conformity assessment activities including calibration, testing, certification and inspection.

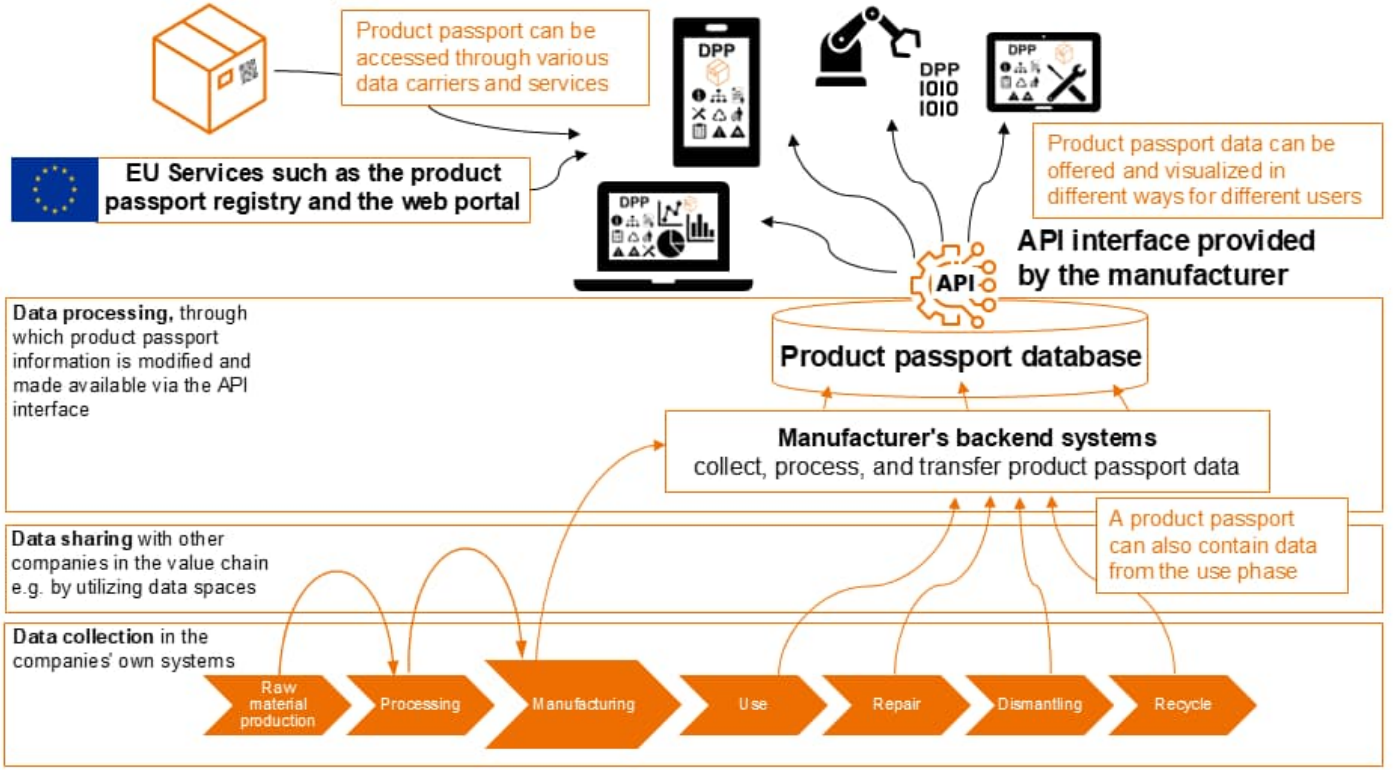

Figure 5. DPP provides data from value chain to different users.

It is mandatory for manufacturers, their representatives, and importers to the EU market to issue a DPP, i.e. to implement and maintain the DPP. Actors in the subcontracting chain are required to provide the information necessary for DPP issuers to compile the DPP. In addition to the production value chain, DPP information can also be utilised for the repair, reuse, and recycling of the product, as well as at the end of the product's life cycle. Actors involved in the repair, reuse, and recycling of the product may be required to update the DPP. As an example, a battery passport may include information and data resulting from the use phase, such as the number of charging and discharging cycles and negative events like accidents, as well as information on the operating environmental conditions. This information is only accessible to persons with the right to read the information.

The stakeholder network

In addition to the direct physical product and data value chain actors, there are also other stakeholders who have an interest and can benefit from the DPP data content. In the Figure 6 we provide a view of the broader stakeholder network that expands beyond the immediate product value chain and the DPP data value chain.

To show the broader stakeholder groups we have grouped the stakeholders in four categories (see Figure 6):

Stakeholders participating in the physical value chain:

- Actors in the production chain who convert raw materials into final products
- Actors involved in the use phase, including those participating in the sale, use, maintenance, reuse, and recycling of the product
- Actors involved in the final disposal

Stakeholders participating in the digital value chain:

- Actors enabling the DPP solution, e.g. solution providers and integrators
- Data market places and platforms

Stakeholders related to regulation and governance:

- National government actors
- The European Commission

Companies and societal actors outside the value chain:

- Other companies outside the value chain
- Finance actors
- Funding organisations
- Interest groups
- Civil society actors
- NGOs
- Research institutions

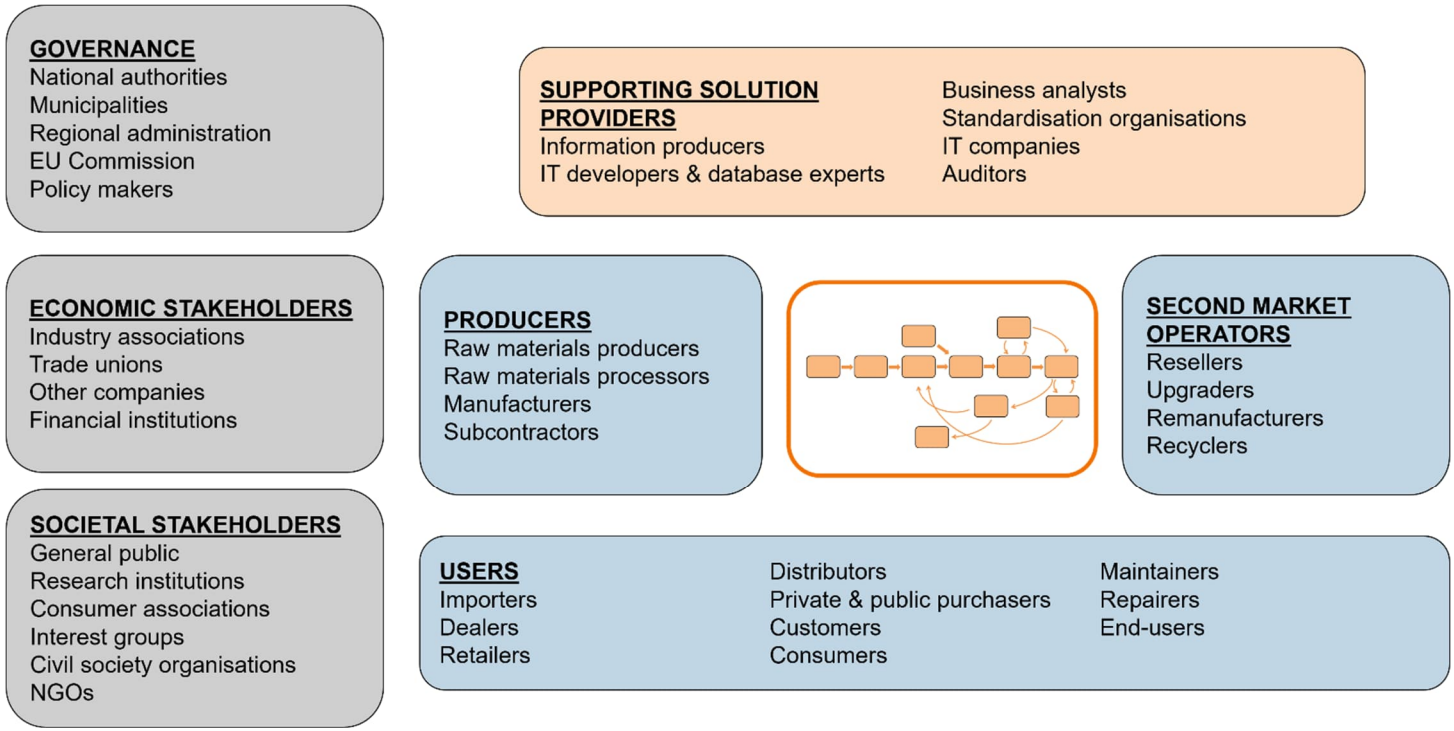

Figure 6. Stakeholder network actors of the DPP.

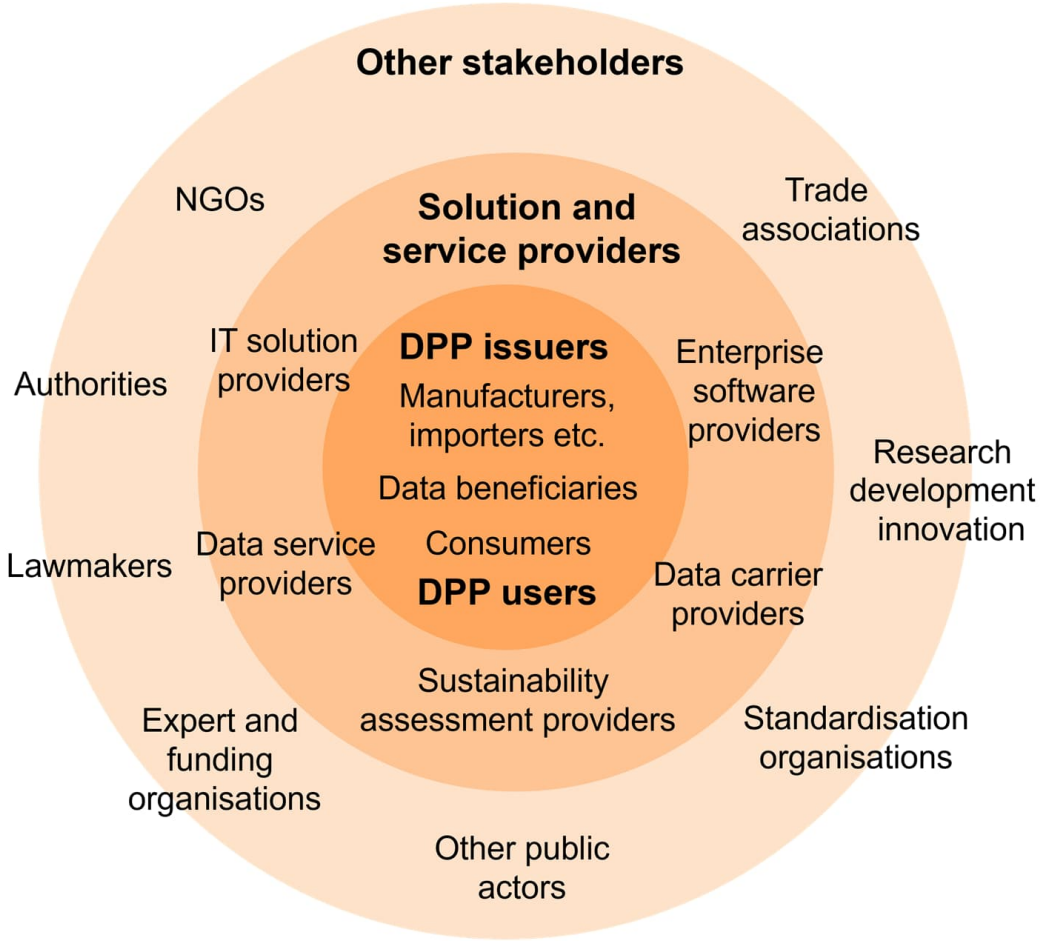

Figure 7. The DPP issuer and the customers of the product as the primary target group are at the core of the DPP development. Other stakeholders are needed as enablers, developers, regulators, policy makers and even whizzle blowers.

When developing and implementing a DPP, it is important to identify the primary data users, so that the information offered is relevant and reaches the target audience and leads to sustainable choices and use patterns. The DPP issuer and the customers of the product as the primary target group are at the core of the DPP development (see Figure 7), but other stakeholders are needed as well: enablers, developers, regulators, policy makers and even whizzle blowers. Collecting customer and value chain feedback for the first DPP designs and iterating the solutions is important to serve the ultimate purpose of the DPP.

Further information:

See Appendix A for practical tools to identify the value chain roles.

4 Set targets according to your strategies

Strategies and motivations for the DPP implementation

The DPP is a mandatory requirement but also a potential game changer for a company's business. Depending on the company business mission, core values and business strategies, the DPP can play a major role in business renewal beyond the compliance step. On the other hand, utilising the DPP data and data sharing structures for new business can take up resources and require long-term commitment, so the ambition level should be set accordingly. In all cases, it will make sense to explore the DPP opportunities before setting the targets for the DPP.

As DPP practices and systems are still emerging, it may be difficult to assess and develop all the new opportunities from the broad spectrum of possibilities that both the DPP data content and data sharing structures will provide. Depending on the company's business strategy and sustainability goals, the DPP can be leveraged in diverse ways as pictured in Figure 8.

As a minimum, a company subject to the DPP regulation has to **comply** with the regulatory requirements (see Figure 8). This will include compiling, collecting and providing the data as required by the value chain partners in a standard form to a DPP platform or system. Further, any products will have to be marked according to the product-specific regulation (data content and data carriers) and connected to the EU data repositories as instructed.

A more ambitious and potentially more profitable strategy is **to actively utilise the DPP data in business**. The DPP provides an opportunity to for example differentiate the product in the market, to increase interaction at the customer interface, to develop the supply chain, or to improve product design.

A forerunner may choose an even more ambitious strategy and start building **completely new business based on the DPP system**. In addition to utilising the data content required by the regulation, this might also entail adding new information categories in the DPP. Additional data content may enable new value creation strategies and models on elaborated analytics and data sharing.

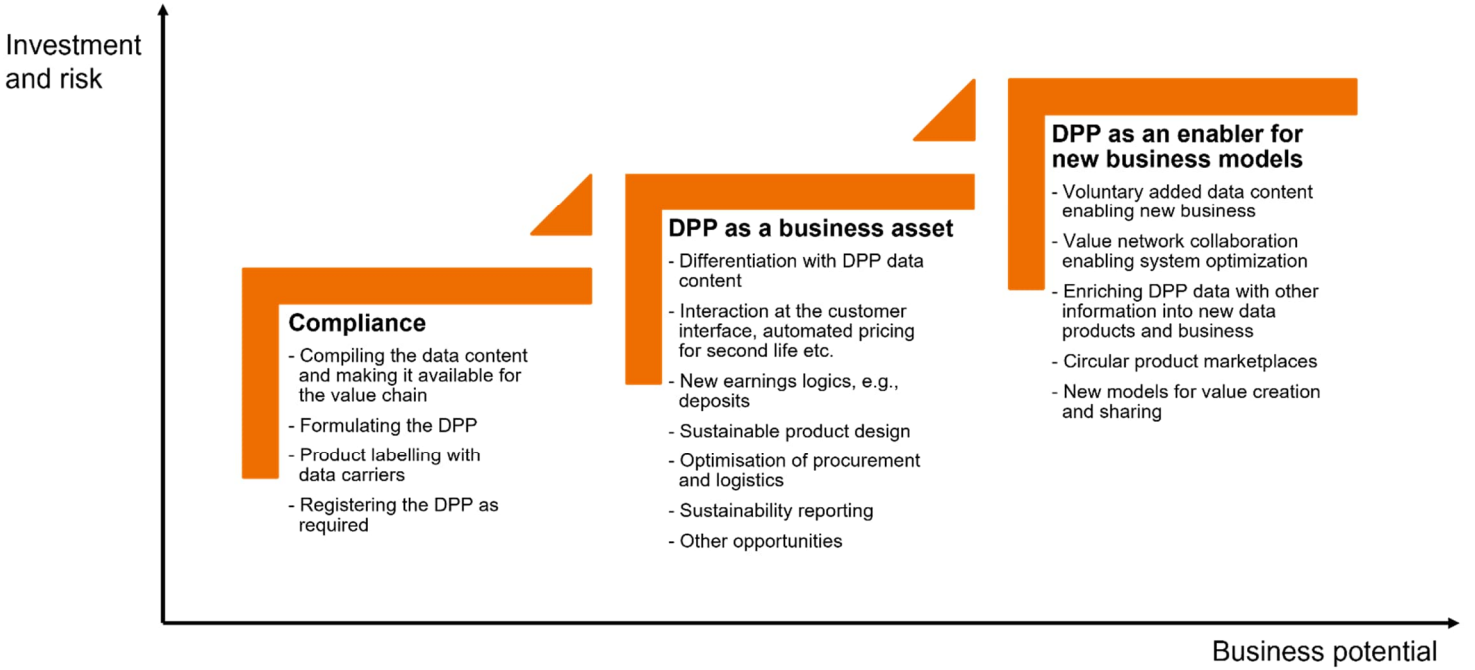

Figure 8. Positioning the DPP as a business asset in company operations; the effort, risk and business opportunity grow with the ambition level.

Developing business opportunities based on the DPP calls for creative thinking and joint exploration in the value chains and actor networks. The opportunities can emerge from many angles.

Product design: In addition to compliance, ecodesign can respond to market sustainability demands. Reliable data is the starting point for a truly sustainable life cycle design. Making relevant data available and sharing it through and across the value chain may enable better use of recycled material streams as raw materials, for example. Optimisation of the designs for extended and intensified use cycles becomes easier. Sharing the data in the value chain in more detail in a controlled manner provides also input for just-right-for-the-purpose and tailored designs. Connecting DPP data to product design as an input can pinpoint the hotspots for product development. It can further provide a mechanism to collect and trace the value chain information.

New circular business and earnings models: The DPP provides a framework for data collection, management, and access points, as well as a set of rules, agreements and practices for data use. At the company level, new opportunities arise in utilising product data assets in a controlled and systematic manner. The future DPP may, for example, enable data input by product users to become part of the data deposit and that way connect the manufacturing loops to use loops, thus enabling product or material-as-a-service models and other circular business models. The earnings logic may shift from pieces-sold to use-based pricing and earnings models. Plain manufacturing business models may shift to repair and maintenance models. Also, data systems, tools and management services provide new business opportunities, and the data itself can become a product.

Sustainable supply chain management: A product's sustainability impact often strongly reflects the raw material's qualities and origin. The DPP requirement to report product data may lead to beneficial discoveries in the value chain: improvement opportunities in terms of the raw materials sustainability; logistics optimisation for more cost-effective and sustainable sourcing; or new bio-based raw materials replacing non-renewable materials, for example. The data-based co-development of materials with the supply chain may at best lead to innovative solutions that build a competitive edge all the way through to the product and customer application.

Communications: The DPP requires separately defined product data to be made available for the customer, enabling product comparisons, sustainable procurement, and educated purchase decisions. In addition, raising awareness and educating customers on the products' sustainability aspects on a voluntary basis may pave the way for differentiating the product and building a competitive edge upon sustainability. Communication and sustainability claims must be based on data and scientifically or otherwise accepted measuring and reporting practices, observing the relevant regulations. The DPP provides a mechanism to collect, trace and communicate validated product information.

Brand protection and risk management: The DPP forces the DPP issuer companies to scrutinise their manufacturing processes and to report substances of

concern in order to fulfil the requirements. The DPP and improved access to data further enables monitoring the market for competition and potentially for infringements. Further, unique identifiers offer opportunities to embed brand protection elements in the traceable data stream. Overall, a better understanding of the product profiles in the market makes it easier for a company to prepare for risks and opportunities alike.

Responding to changes in the operational environment: A recent EU regulation on sustainability and safety, such as the ESPR and the Corporate Sustainability Reporting directive, including specific products and industry regulations, such as the Battery Regulation, makes it challenging for companies to take their bearings in the changing operational landscape. Internally organising, resourcing and streamlining operations and data management and proactively connecting to relevant data ecosystems outside the company can provide a forerunner position in the market. Trials and pilots help focus and prioritise efforts.

DPP use cases

The manufacturing, use, repair, reuse and disposal stages of a product's life cycle each create new product data. Currently, this information is dispersed and only partly available and used by the value chain actors. The DPP now compiles this information, and the data can be shared with relevant stakeholders, creating value and benefit for business and the environment

Some potential DPP use cases are shown in Figure 9. These use cases are collected from project workshops and the literature (CircThread CWA process), and they are motivated by business and technology drivers but also by sustainability targets in companies. Regulation plays an important part as well. The stakeholders for the use cases are varied, and they present varied value creation opportunities for businesses.

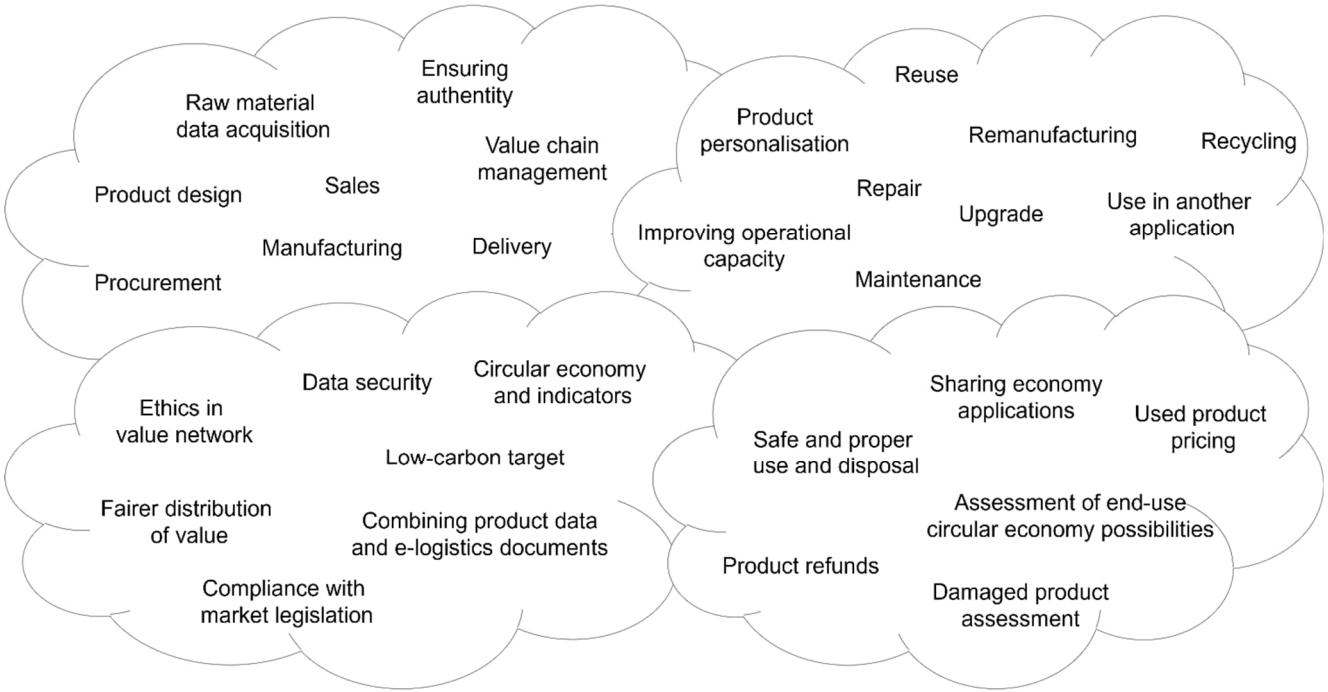

Figure 9. Motivations and uses for the DPP. Modified from the CircThread CEN workshop and edited in the FINNPASS workshop.

DPP data provides opportunities to both improve the existing operations and to create completely new solutions and business. The DPP data can be used for a variety of purposes across the value chain and broader stakeholder network. Use case overview can serve as an inspiration for companies to reflect 1) which use cases could be relevant for their business, 2) how and what data can be relevant for their business, and 3) which partners are needed to implement the business idea in practice.

The implementation of the DPP creates also business opportunities for various data analysis and service solutions. If DPP interfaces are opened to product users allowing them to input usage data, business opportunities related to reuse, repair, recycling, and remanufacturing etc. can become even more attractive.

Further information:

Tools for data identification and value chain mapping is available in Appendix A.

An online tool to analyse, ideate and develop the circularity potential of innovation ecosystems: https://www.circularitydeck.com/.

5 Define your data and system requirements

Regulatory data system and management requirements

The ESPR states the general information requirements for the DPP. These include, for instance, general product information, information related to the manufacturer and importer, user manuals, instructions, and warnings or safety information.

The specific information requirements for each product group will be specified through delegated acts. The delegated acts will also specify the DPP data levels by the model, batch or item level. The information requirements for batteries are already described in the Battery Regulation (EU 1542/2023). The delegated acts for steel and iron, and textiles are expected to be completed in 2026.

The general DPP information requirements described in the ESPR are presented below. The listing is not a comprehensive summary but rather lists the broad data content, all or some of which may be required in the specific product DPP. Thus, the data requirements provided in Table 1 and this chapter may be reduced or fine-tuned.

Table 1. Suggested DPP data requirements based on the ESPR regulation; modified from (EU 1781/2024).

Basic product data
▪ A unique product identifier ▪ A Global Trade Item Number or equivalent ▪ Relevant commodity codes, such as an EU Common Customs Tariff code ▪ Compliance documentation and information such as a declaration of conformity ▪ User manuals, instructions, warnings or safety information ▪ Information related to the manufacturer ▪ Unique facility identifiers ▪ Information related to the importer ▪ Information about the provider of compliance-related information

▪ The DPP service provider hosting the back-up copy
Substances of concern
▪ The IUPAC name or another international name ▪ Other names, including the usual name, trade name, abbreviation, EC number (EINECS, ELINCS or ECHA) ▪ The CAS name and number ▪ The location of substances of concern ▪ The concentration, maximum concentration or concentration range ▪ Relevant instructions for the safe use of the product ▪ Information relevant for disassembly, preparation for reuse, reuse, recycling and management of the product at end of life
Composition, performance and disposal
▪ Information on the performance of the product in relation to the product parameters* ▪ Information on installing, using, maintaining and repairing the product, collection for refurbishment or remanufacture and the return or handling the product at end of life ▪ Information for treatment facilities for disassembly, reuse, refurbishment, recycling, or disposal at end of life ▪ Other information regarding sustainable product choices and appropriate use, value-retaining operations and correct treatment at end of life

**The product's durability and reliability, such as the guaranteed lifetime; the ease of repair and maintenance; the ease of upgrading, reuse, remanufacturing and refurbishment; the design, ease and quality of the product for recycling; the consumption of energy, water and other resources; the use of the content of recycled materials and recovery of materials; the use or content of sustainable renewable materials; the weight and volume of the product and its packaging, the product-to-packaging ratio; the incorporation of the used components; the environmental footprint, carbon footprint, material footprint; micro and nanoplastic release; emissions to the air, water or soil; the amount of waste generated*.

Much of the basic data is typically already available and used for product labelling and data sheets, including product-specific identifiers, information about the manufacturer and importer, and information about the provider of the DPP. This data may already be required by a different product regulation, such as REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals). This is true typically also for the substances of concern category. However, some additional information production, studies and development activities may be required to produce data regarding for example sustainable use, maintenance and repair, remanufacturing and disposal of the product. Product parameters should include, for instance, the product's guaranteed lifetime, the use or proportion of recycled materials, packaging information, and environmental footprint. The product

footprint calculation methods are also part of the delegated acts working group agendas.

The ESPR regulation sets requirements for the DPP. All data included in the DPP shall be transferable through an open interoperable data exchange network without vendor lock-in. The data must be in interoperable and machine-readable formats. The issuer of DPP is mandated to ensure the availability of a back-up copy through a certified independent third-party DPP service provider. The current understanding is that the Commission shall provide the DPP registry service that stores and manages the data related to DPPs.

Data sources and internal data management

A reliable DPP is built on reliable information. Much of the information needed for the DPP is likely available in some format within the company system. Companies may have IT solutions and other digital tools that can be used for providing data and compiling the DPP. Integrating information into the DPP system may require customised conversion software or building interfaces to existing IT systems.

Some of the required data and information can be purchased as services from external service providers, such as life cycle and sustainability assessments, the carbon footprint or other environmental impact and sustainability information. Even then, efficient data transfer interfaces improve data management by reducing manual work. Information on paper documents must first be validated and converted into digital form before it can be utilised in the DPP.

The collection of DPP data can begin by determining what information requirements apply specifically to the particular product. Next, it will pay off to identify the data sources for each data item; data can be available in the company IT systems or if it can be obtained from another actor in the product value chain. At the same time, it is important to understand the potential users for the particular data, that is, who should have access to the information. The information can also be useful to actors who do not necessarily need it but could use it to improve their own operation, or the operation of the value network. We present a simple data matrix in Appendix A to illustrate the data mapping process.

An example of building business cases on selected DPP data

Collecting and sharing use data between stakeholders may offer opportunities for new business in product after-market. Figure 10 shows a typical battery value chain. The data points have been selected from the Batteries Act tentative listing as key parameters for enabling second life business cases. Examining the value chain and the data points attached to it increase the understanding of accumulation and utilisation of product information during the product’s life cycle. It can also initiate discussions between actors about the possibilities and willingness for sharing data towards shared business benefits and sustainability.

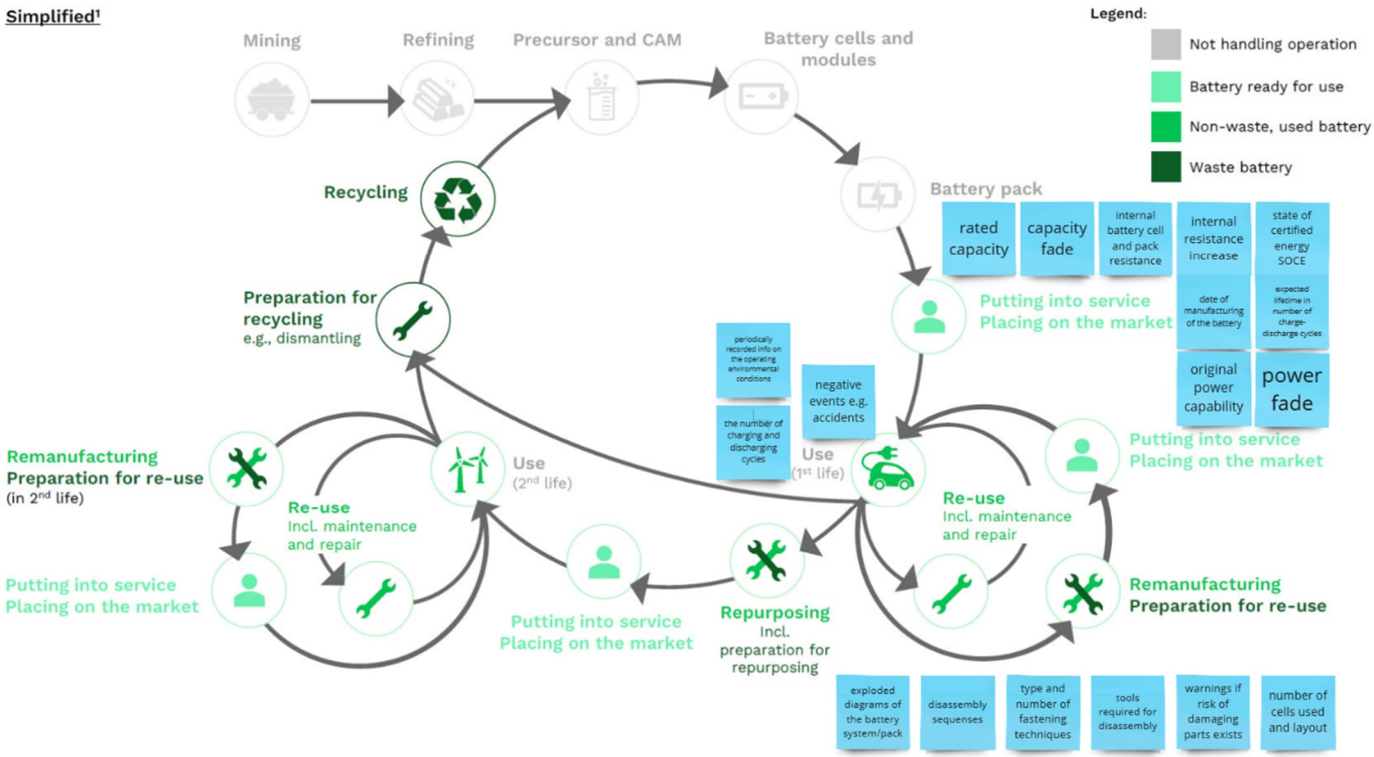

Figure 10. An example of the data points and parameters that enable new business models for the reuse of batteries. The result of FINNPASS battery passport workshop. The figure has been modified from the Battery Passport Content Guidance v1.1 2023.

The Battery Passport is not just a static document but also requires dynamic data updates throughout the battery’s life cycle. Continuous monitoring of parameters like State of Health (SoH), charge cycles, and performance metrics ensure that the passport reflects the battery's real-time condition. In Figure 11, we illustrate an example of how battery status information can be collected and integrated into the Battery Passport. As shown in the figure, the BMS (battery management system) automatically collects the battery status information that can be provided to the digital battery passport.

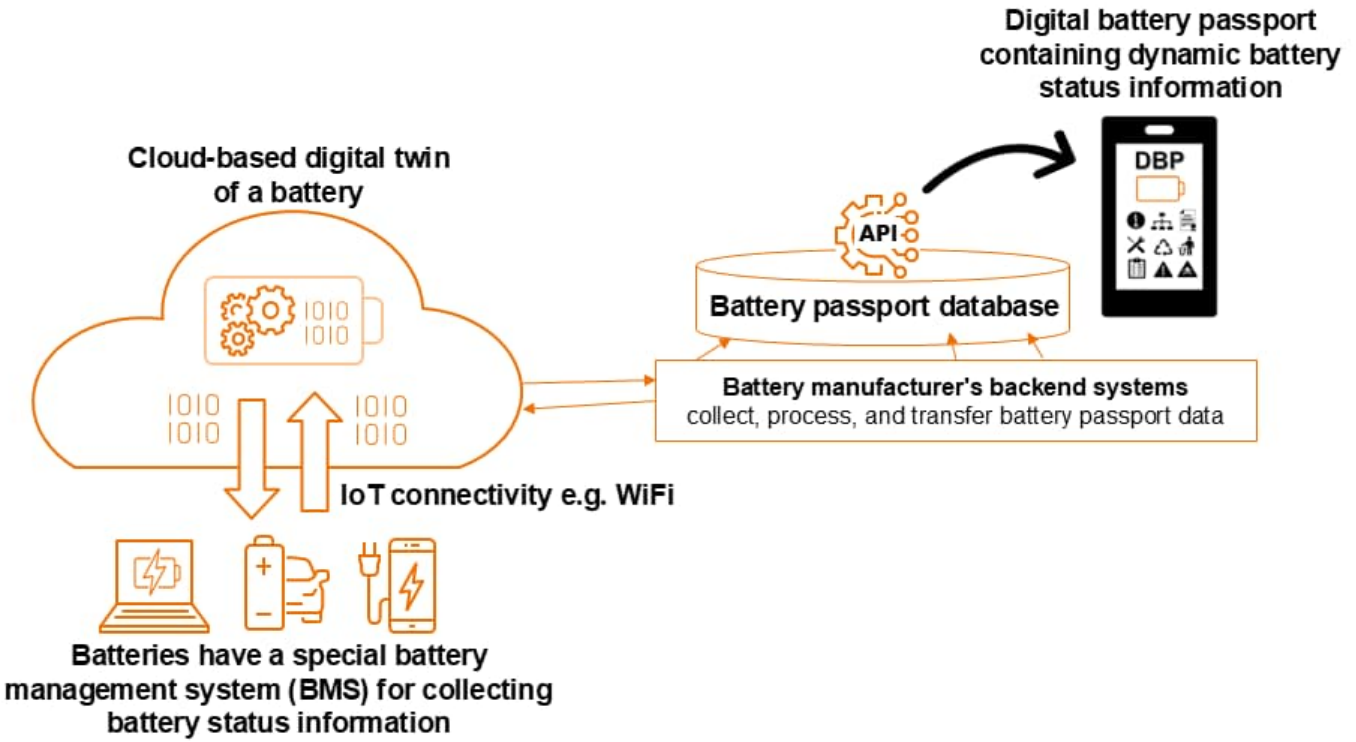

Figure 11. An example of collecting dynamic battery status information to the digital battery passport (DBP).

Collecting and sharing DPP data in the value chain

A company almost always needs value chain partners in order to collect DPP data. Data is required on the upstream of the value chain (information on raw materials and components, raw materials processing, manufacturing, logistics etc.), and the downstream of the value chain (repair, reuse, remanufacturing, recycling and disposal, etc.). Therefore, it is important to ensure smooth cooperation between value chain actors and to establish common rules and procedures for data sharing. Mutual trust is essential for data sharing, cooperation, and the development of new business opportunities. In the initiation phase, connecting directly with the main value chain partners and setting up special collaboration initiatives with assigned persons may be helpful.

Many providers offer services and have also developed IT solutions, models and tools that enable data exchange through standardised interfaces. The CIRPASS project has assessed DPP solutions in the global and European setting, and in Finland, the FINPASS project has mapped Finnish DPP solutions available or in development.

Several DPP solutions are currently available on the market, offering comprehensive mechanisms for data sharing throughout various stages of the product life cycle and across different data carriers. Extensive comprehensive solutions enable the sharing of product data at different stages of the product life cycle and between data media. Some solutions are specifically tailored to particular product groups, thereby simplifying the creation of a DPP solution to address specific queries. Some of the solutions integrate data from company systems onto the service provider's platform, while others implement decentralised data sharing. An overview of domestic DPP solutions can be found in Appendix B. Additionally, experiments conducted within the construction sector and Tax Administration are documented in Appendix C-E.

When forming rules for data sharing, it is essential to identify first the data needs and actors involved. The next step is to investigate the details in data sharing, such as form and update frequency of the data, data users, the current data sharing rules, DPP specific needs, and the potential challenges and new opportunities. It also makes sense to follow the development of the interoperability etc. standards, so that any potential IT investments are made accordingly.

Data sharing has been developing and is promoted as a potential game changer to create a new data-based economy (e.g. the European Gaia X initiative and the Data Space Alliance).

We give below a simple checklist for data sharing:

What data needs to be shared?

Who are the actors needed for collecting data to meet DPP requirements?

- Who are the actors in the product value chain? Are there other actors in the data management and user value chain? What information is needed from them for the DPP? What is the quality of the information, and how often does the information need to be updated?

Who uses the data? How?

- Who are the data users? How does the customer or user benefit from the DPP data? When and where?
- What is the data in a format that the other actors can also utilise? Is my data in the right format and interoperable?

How is the data shared between the actors?

- What are the current rules for data sharing? Are all parties committed to following the rules?

Is there a need for updating the rules and practices?

- Do the rules work? Does the DPP bring a need to update the rules or practices?

Further information:

Data capabilities assessment and development tool:
https://tieke.fi/digikyvykkyys-on-pk-yrityksen-kilpailuetu-nain-tieke-toimii-tukena/
Finnish Information Society Development Centre TIEKE Tietoyhteiskunnan kehittämiskeskus ry

Opportunities and changes entailed by the EU's new data-related regulations, self-study material: https://www.sitra.fi/hankkeet/datatalouden-abc/

Rulebook model for a fair data economy (version 3.0) w. agreement templates and other tools to build and joint new data spaces:
https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy/

Lessons learned from data space projects; the current state of Finnish data space work and insights on how to quickly utilise the benefits of data spaces in the coming years: https://www.sitra.fi/en/publications/state-of-finnish-data-spaces/

Data sharing smart contracts, models, standards, guidelines and tools:
https://dssc.eu/space/bv15e/766066627/Contractual+framework

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Further information:

Data capabilities assessment and development tool:
https://tieke.fi/digikyvykkyys-on-pk-yrityksen-kilpailuetu-nain-tieke-toimii-tukena/
Finnish Information Society Development Centre TIEKE Tietoyhteiskunnan kehittämiskeskus ry

Opportunities and changes entailed by the EU's new data-related regulations, self-study material: https://www.sitra.fi/hankkeet/datatalouden-abc/

Rulebook model for a fair data economy (version 3.0) w. agreement templates and other tools to build and joint new data spaces:
https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy/

Lessons learned from data space projects; the current state of Finnish data space work and insights on how to quickly utilise the benefits of data spaces in the coming years: https://www.sitra.fi/en/publications/state-of-finnish-data-spaces/

Data sharing smart contracts, models, standards, guidelines and tools:
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6 Get going – the practical steps

The ESPR and the delegated acts for the mandatory DPP will be adopted in some product groups within two years from today (from March 2025) for certain product groups. Although not all standardisation is ready yet, the forerunners have already taken steps and are proceeding with their best technology and data requirement estimates. As the DPP is proceeding in multiple fronts (IT solutions, regulation, technology development, standardisation, product development and marketing, best practices etc.), the development will be speedy. Waiting for the deadline may be detrimental for individual product sales and market position. Thus, we recommend starting the work now.

The picture (see Figure 12) shows the layers of decision-making, collaboration and management to implement the DPP: we need to address all these layers and flexibly move between the DPP information system, the factual implementations and the data content in the implementation.

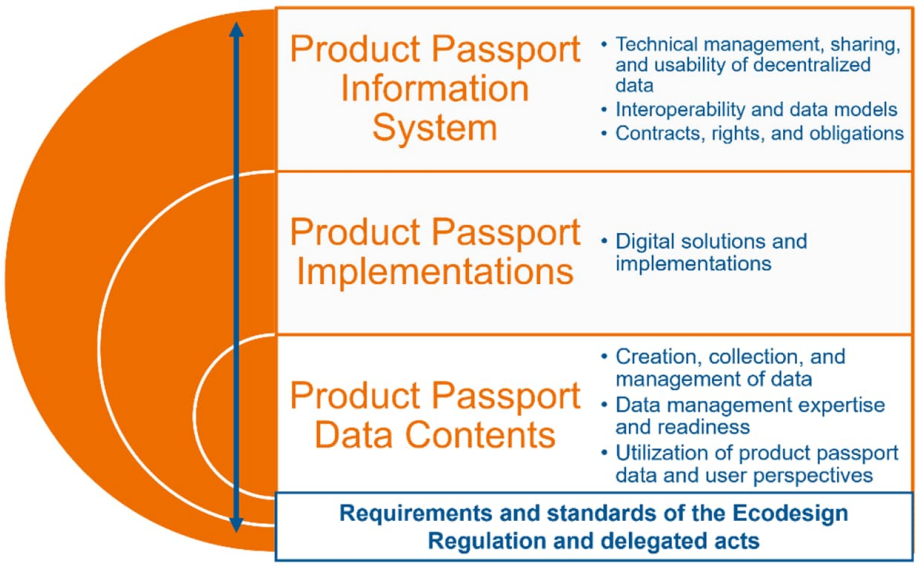


Figure 12. Implementing the DPP requires building collaboration at and between different system levels.

Given the complexity and scope of these tasks, initiating the implementation process early is essential to effectively navigate potential opportunities but also challenges, such as data management complexities and the need for standardisation. Proactive planning will position companies not only to comply with minimum requirements, but also to leverage DPPs for enhanced transparency, sustainability, and competitiveness in the evolving market landscape.

Implementing DPPs can be divided into the following four steps, see Figure 13.

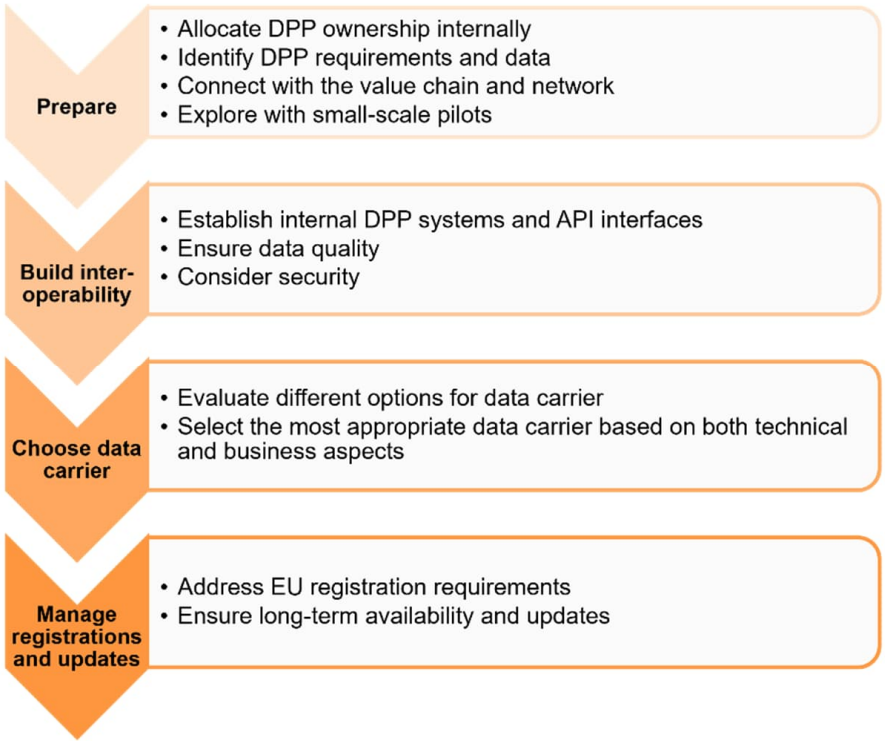


Figure 13. A graph for implementing the DPP:

The action steps are described in more detail in Appendix F. They outline the key implementation actions companies should take to ensure compliance with DPP regulations. Some of the actions are not strictly necessary but rather suggestions to consider, since they can significantly assist and simplify the management of DPP data.

To prepare for DPP deployment, companies should first designate a responsible individual or department to oversee the initiative, ensuring accountability and streamlined implementation. Engaging with industry networks, standardisation activities, and technology providers can provide essential resources, training, and standardised frameworks to support DPP integration. Additionally, identifying required data, initiating early data collection, and running small-scale pilot projects

will help refine processes, address challenges, and facilitate a smooth transition to compliance with future regulations.

INFOBOX: Digital maturity is a prerequisite for effective DPPs

The implementation of DPPs is closely linked to the digital maturity of companies, as the ability to collect, manage, and share product-related data requires advanced digital capabilities. Many companies, especially small and medium-sized enterprises, still rely on fragmented or manual data management practices, making the transition to DPPs challenging. The introduction of standardised and machine-readable product information demands investment in IT infrastructure, the integration of digital tools, and the adaptation of internal processes.

In practice, companies often face difficulties due to legacy systems, a lack of interoperability, and insufficient data governance frameworks. Many firms do not yet have centralised databases or structured processes for capturing product life cycle information. Addressing these gaps requires a systematic approach to digitalisation, including the adoption of common data standards and automation solutions that facilitate the seamless exchange of information. Companies that have successfully advanced their digital maturity often implement enterprise resource planning (ERP) systems, cloud-based platforms, or Internet of Things (IoT) solutions to enhance data accessibility and traceability.

A key step towards improving digital readiness for DPPs is strengthening data management capabilities. This involves establishing clear responsibilities for data collection, validation, and maintenance within organisations. Companies also need to enhance internal competencies by investing in employee training and fostering a data-driven culture. Collaboration across value chains is essential, as DPPs rely on accurate data contributions from multiple stakeholders. Standardised interfaces and regulatory incentives can further support businesses in overcoming technological and organisational barriers, ensuring a smoother transition towards digitally enabled product documentation.

Further information:

Neligan, A., Schleicher, C., Engels, B., & Kroke, T. (2023). Digital Product Passport as Enabler for the Circular Economy: Relevance and practicability for companies (IW Report 47/2023). Institut der deutschen Wirtschaft Köln e. V. https://circulareconomy.europa.eu/platform/sites/default/files/2024-02/IW-Report_2023-Digitaler-Produktpass-englisch.pdf

TIEKE (The Finnish Information Society Development Centre) can provide resources and support for increasing your company's digital maturity in the forms of e.g. digital skills development and digitalisation projects.

Interoperability is a key to successful implementation of the DPP requiring a clear understanding of a company's role in the overall process, as well as an awareness of industry-specific requirements and relevant standards. Each organisation operates within a broader value chain, where the ability to provide, process, and utilise product-related data effectively is essential. Ensuring compliance with existing regulations and aligning with standardised data formats are key factors in facilitating seamless data exchange. Interoperability can be improved through multiple approaches, starting with the harmonisation of internal data structures and systems. Companies should assess the compatibility of their data models with industry standards and adopt frameworks that enable easy integration with external stakeholders. In addition, it is important to consider security aspects for DPP data integrity and protection (see the infobox below).

When **selecting a data carrier** for DPPs, both technical and business perspectives must be carefully considered. The choice of the appropriate data

INFOBOX: Safeguarding DPP data requires a holistic security approach

DPP security is a multilayered challenge that encompasses data integrity, encryption, secure access control, interoperability, and threat detection. To cover these, numerous security technologies are available. The selection of technologies for specific DPPs is highly dependent on the stakeholder needs, the system constraints, regulatory requirements and the complexity of the supply chain. For example, the required DPP security mechanisms vary for consumer goods, industrial components or regulated sectors (like those for batteries and medical devices). Anyhow, some general techniques can be mentioned as examples:

Data integrity is maintained through cryptographic techniques such as digital signatures and hashing algorithms, while blockchain and distributed ledger technologies can provide tamper-resistant records. Robust encryption mechanisms, including AES-256 for data at rest and TLS 1.3 for data in transit, ensure confidentiality. Access control frameworks, such as Role-Based (RBAC) and Attribute-Based Access Control (ABAC), restrict data access based on predefined policies, while decentralised identifiers (DIDs) and verifiable credentials (VCs) enhance trust and interoperability. Ensuring traceability and data provenance is critical, supported by graph databases and Zero-Knowledge Proofs (ZKPs), which allow verification of product claims without exposing sensitive details. Additionally, API security mechanisms, including OAuth 2.0 and JSON Web Tokens (JWTs), protect data exchange across platforms. To detect and mitigate threats, security monitoring tools such as intrusion detection systems and automated incident response mechanisms should be deployed. Compliance with cybersecurity standards, including GDPR, ISO 27001, and the NIST Cybersecurity Framework is essential in order to align DPP implementations with regulatory requirements and industry best practices. Finally, European data space initiatives such as IDSA and Gaia-X, provide data sharing frameworks that directly support the security, interoperability, and scalability of DPPs by promoting federated data infrastructures, data sovereignty, and trusted networks.

Further information:

ENISA (The European Union Agency for Cybersecurity) is the EU's dedicated agency for strengthening cybersecurity across member states. It provides guidance, policy recommendations, and technical expertise in order to enhance cyber resilience, support regulatory frameworks, and promote best practices in areas such as network security, data protection, and emerging technologies. https://www.enisa.europa.eu/

Gaia-X (2021). Policy Rules and Architecture for a Federated Secure Data Infrastructure. This report provides guidelines and frameworks for secure, interoperable, and federated data infrastructures within the European digital ecosystem. https://gaia-x.eu/

van den Eijnden, A. (2024). Unlocking Trust in Digital Product Passport: An fsQCA & Multiple Linear Regression Approach [Turku School of Economics (TSE) Tilburg School of Economics and Management (TiSEM)]. https://www.utupub.fi/bitstream/handle/10024/179013/vandenEijnden_Anne_Thesis.pdf;jsessionid=29E400E8F240C399CCBC0550BE594870?sequence=1

format or technology significantly influences the functionality, scalability, and usability of the DPP solution. Therefore, a thorough analysis of various implications is essential so that the selected data carrier aligns with the long-term goals and needs of the organisation while providing a sustainable, effective solution for DPP implementation. Key evaluation criteria for data carrier are presented in Appendix F.

Fourthly, businesses must **store a backup of their DPPs** with a certified third-party provider. EU is about to introduce a centralised service for long-term DPP data accessibility providing links to the DPP backups. Therefore, manufacturers should also ensure that these links along with product identifiers are correctly **registered in the upcoming EU DPP registry**. Each product needs e.g. a unique identifier and identifier of the production site. These should be formatted following evolving regulatory and standardization requirements. For products subject to customs procedures, the appropriate codes must also be registered to facilitate proper classification and trade compliance.

Finally, throughout the product's lifecycle, maintaining accurate and up-to-date DPP data is essential, requiring companies to establish internal processes and assign clear responsibilities for **regular updates**. As the regulatory landscape continuously evolves, businesses must stay informed about changes for ensuring compliance. As mentioned earlier, for Finnish companies, Ekosuunnittelu.info web site is a good source of information.

Further information:

DPP system architecture and integration: CIRPASS, Wenning, R., Papadakos, P., & Bernier, C. (2024). DPP System Architecture. https://doi.org/10.5281/ZENODO.1094984

EU Common Customs Tariff (TARIC), information on customs codes and requirements: https://taxation-customs.ec.europa.eu/customs-4/calculation-customs-duties_en

EU Chemicals Regulations (REACH and CLP): https://environment.ec.europa.eu/topics/chemicals/reach-regulation_en

European Commission Customs Legislation and Guidelines: https://taxation-customs.ec.europa.eu/customs-4/customs-procedures-import-and-export_en

CEN/CENELEC JTC24 creates harmonized standards for DPP system. The work of JTC24 happens through **national standardisation bodies** (SFS in Finland).

7 Build business on the digital product passport

Benefits beyond compliance

The DPP will become a legal obligation, but a forward-looking company will turn the DPP obligation from a mere expense into a business opportunity.

The DPP issuers need to comply with the minimum level of regulation and provide the mandatory data to stay in business. However, identifying other business uses for the DPP and related data may open significant new opportunities, from improved raw materials and supply chain management to predictive maintenance and service business models. Figure 14 illustrates some opportunities in the value chain for turning DPP and data into a business enabler.

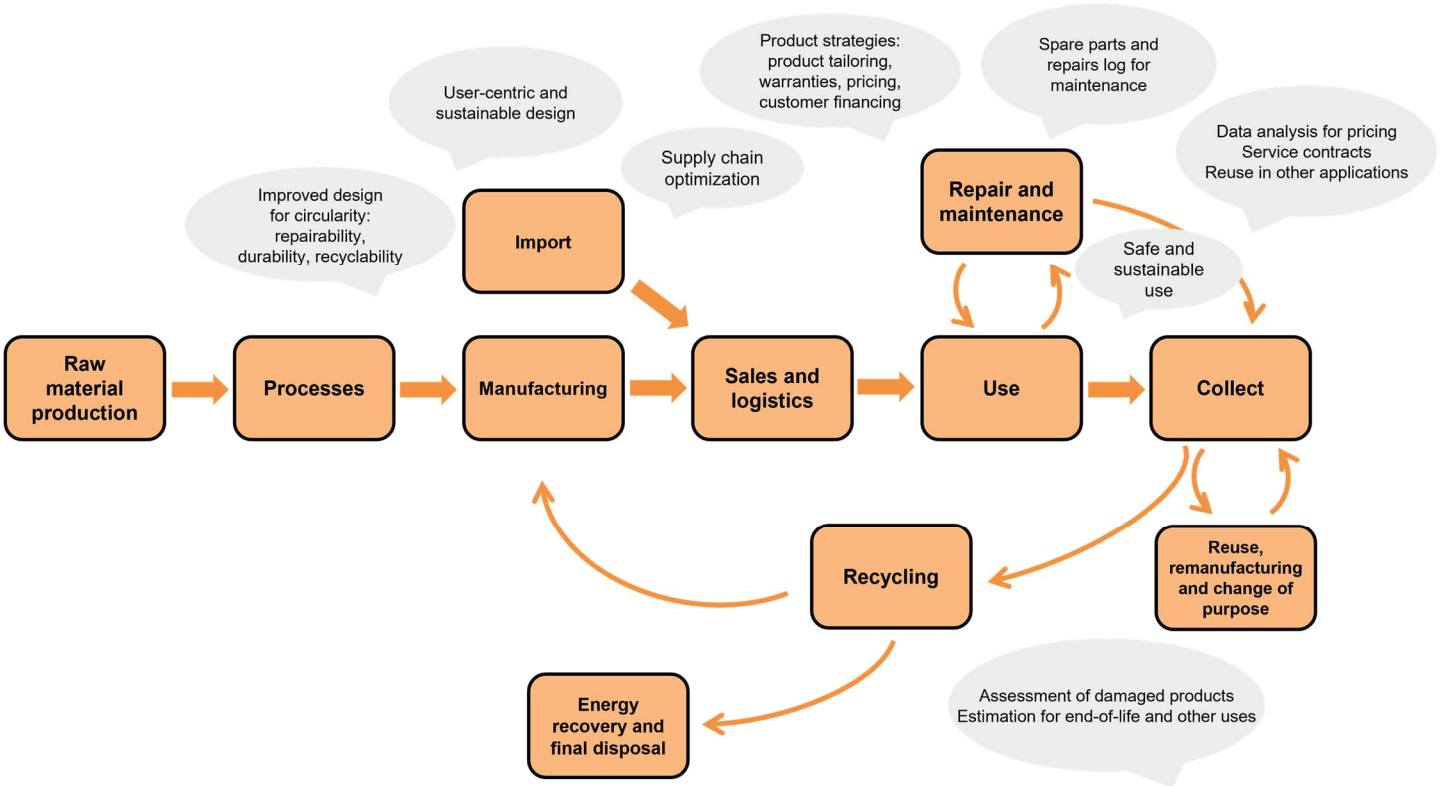


Figure 14. Examples of DPP use case through the value chain in the FINNPASS workshop.

Product design, maintenance and lifetime extension. The DPP provides at its best access to the historical data of devices, such as maintenance records and spare parts management. This enables a data-based feedback loop to product design and services. It can lead to improved and just-right-for-the-purpose material selections and product designs. Maintenance can become predictive with minimised equipment downtime and cost savings to the equipment operator. Maintenance programs can further be tailored based on the use. A better availability of product information helps also develop the service business by providing customers with access to more accurate information about the condition of the product or device and the maintenance program. This increases customer satisfaction and commitment to the service provider. Above all, the lifetime of the product may be extended, and a circular business model can be established.

Sharing platforms and new data-enabled value chains. The DPP automates and standardises data collection, reducing manual collection and input of unstructured data and errors. Documentation, reporting and use of data for business become more efficient and automated. When data is compatible and interoperable, it can generate significant added value for several stakeholders. Adding usage data on the DPP can also enable automatic pricing of new or used products and further enable an operating model for sharing platforms or new models of value sharing in a partner network. Co-ownership and co-use models become easier to implement. New business will emerge in the data value chains for new players, such as platforms offering tools for implementation of sharing models by individuals, etc.

Environmental impact monitoring and improvements: Systematically collected and reported data by the product and in the formal DPP context offers opportunities for assessing environmental indicators. Carbon dioxide emissions of products can be monitored and reported throughout their entire life cycle, if we collect for example energy consumption data dynamically. This data can be used for environmental impact assessment, product design and reporting. Also, policy makers, regulators and other public stakeholders may benefit from this data.

Additional services with QR codes: QR codes as data carriers can be used for providing customers with additional information about the product, such as operating instructions or updated maintenance instructions, or additional services, such as the opportunity to register the product under warranty. Customers can also be offered benefits and discounts on additional services and maintenance contracts.

Recommendations: Data summaries can be created and used for providing customers with tailored recommendations that meet individual customer needs. The DPP can promote fair trade in the value chain.

Marketplaces and compensation models: The DPP supports also the digital markets, after-markets and secondary markets for products. Sales and purchases of used products and repairs can be combined on a platform based on standardised and automated DPP and data. Pricing can also be automatic based on product information. This can also increase the value of a new product, when the secondary market is functional.

Condition assessment of the product and user communities: The DPP can collect user feedback and assessments for example on the condition and functionality of the product. By analysing the data, additional information can be obtained about the durability of the product and possible areas for improvement in product design and the design of additional services. An important opportunity lies in advancing customer engagement with a functional and product-specific user interface. The DPP can be utilised to build user communities and prestige around products.

Data enrichment and data marketplaces: The DPP improves and enables document-sharing. This enables enriching and making data more valuable by combining data from different data sources and of different viewpoints. Enriched DPP data can be used to provide personalised recommendations and dynamic pricing, which can improve the customer experience and increase sales. Further, the data in itself can become a product for example for business intelligence and marketing.

Deposit models and the reuse market: The DPP enables new business models such as deposit. As the DPP can track the product the customer can be reimbursed for returning a product for recycling or reuse. Product returns can also be tracked over a longer period, for example by attaching identification data to a loyalty program. The DPP also contains information on safe and sustainable use and disposal of the product. This increases retailers' confidence in the products and provides data for risk management and reuse.

Many further business opportunities and use cases may emerge, such as:

- Indicator development for internal development purposes
- External sustainability reporting
- Customer communications and new ways of interaction at the customer interface; improving customer reach
- Differentiation and increasing the brand value
- Product benchmarking and market analysis
- Promoting ethical and sustainability values
- Brand protection and transparency
- Product life cycle and use patterns follow-up
- Customer and market research
- Sharing, reuse and recommendation platforms

Data has been predicted to transform the way we make business. We are allowed to be creative!

Further information:

A DPP concept by STJM (Finnish Textile & Fashion Association) and the Finnish Technology Industries: https://www.stjm.fi/vaikuttaminen/eu-vaikuttaminen/digitaalinen-tuotepassi/

8 Innovate for the future

DPP regulation and standards are currently developing rapidly. It is likely that as DPPs become more common, the technologies and solutions associated with DPPs will also advance rapidly. We expect to see new innovations sharing and implementing the DPPs and data, as well as in how we use the data. For example, data can be added to many products, applications, and by connecting the data, also to activities and functions. As data carriers develop scanning the data becomes easy for the users and even for other devices, and we may see a data-driven connected society emerging. Also, materials and products may evolve with this trend.

Intelligent products. In the future, products will have the capability to store the use data and internal diagnostics within the DPP. This data can help the user to adjust to the conditions and operate the device in a safe or energy efficient manner, for example. With a suitable choice of data carriers, the products may also convey the data to other products and services automatically, which may provide opportunities for remote use of devices, for example.

Advanced analytics will play a pivotal role in the future of the DPP. Companies can leverage real-time data analyses embedded within the DPP to swiftly adapt to evolving circumstances and user demands. For instance, if a component is discovered to be defective, the DPP's comprehensive data will enable rapid identification of affected products, thereby facilitating prompt and efficient repairs or recalls.

AI and dataspaces. Artificial intelligence (AI) can be harnessed to process and utilise product information, transforming the landscape of consumer knowledge. AI easily resolves product-related inquiries, generating comprehensible summaries on, for example, the environmental impacts of products. AI can collect data from the entire value chain and optimise product and material design and procurement based on genuine environmental considerations, in addition to cost and performance. Additionally, it enables dynamic pricing mechanisms. Both consumers or users and manufacturers gain better access and awareness of the origins, recyclability, and environmental implications of products, actively utilising DPP data to make informed purchasing decisions that are tailored specifically to

them. AI can also connect product data to other data sources and open multiple other opportunities with the manufacturers, as well as the entire value chain.

European dataspaces, such as GAIA-X and IDSA, are secure, interoperable environments designed to facilitate trusted data sharing among businesses, governments, and other stakeholders while ensuring data sovereignty and compliance with European values and regulations. For the DPPs, these dataspaces provide a structured framework for exchanging product-related data across supply chains, enabling seamless access to accurate and standardised information. The benefits are particularly significant for AI-powered DPPs, as they require large volumes of high-quality, structured data to enable intelligent insights, predictive maintenance, automated compliance checks, and life cycle optimisation. Sovereign dataspaces ensure that this data remains trustworthy, accessible, and reusable while protecting sensitive business information.

Data carriers. The current physical data carriers may evolve as well. Data carriers attached to products can be designed to withstand demanding industrial conditions or, if consumers prefer, they can be almost invisible in high-quality design products. Data carriers can be seamlessly integrated within the product and can collect usage data when required. This enables maintaining the product's optimal performance, preventing unexpected and costly repairs, and ultimately extending the entire life cycle of the product.

In the future, we may no longer need QR codes, RFID tags or barcodes to access DPP data. Textile products may incorporate fibres that contain essential data about the product's origin, use, repair, and recycling, and potentially even wear and tear. Similarly, items produced through casting or extrusion techniques, such as various plastics and their bio-based alternatives, can contain granules with embedded data. There will be no longer concern regarding codes wearing off or detaching from the product.

Tokenised business models and sustainability. Tokenised rewards can play a central role in advancing the circular economy by incentivising sustainable behaviours and optimising resource use. Tokens can be connected with DPPs and used e.g. as digital incentives for recycling, reuse, and responsible consumption. Consumers could receive digital tokens when they return used products or packaging to collection points, or when they participate in second-hand markets and product-sharing platforms. Such gamification and financial incentives can make circularity fun and rewarding and encourage more consumers and businesses to adopt circular practices. In the wider scope, tokens connected with DPPs could even be used to create and boost local economies. Businesses and municipalities could create circular economy tokens that could be exchanged for local goods and services, this way strengthening also regional sustainability and communities.

Let's get creative!

References

Regulation:

Regulation 3110/2024. Regulation (EU) No 2024/3110 of the European Parliament and of the Council of 27 November 2024 on laying down harmonised rules for the marketing of construction products and repealing Regulation (EU) No 305/2011. http://data.europa.eu/eli/reg/2024/3110/oj

Regulation 1781/2024. Regulation (EU) No 2024/1781 of the European Parliament and of the Council of 13 June 2024 on establishing a framework for the setting of ecodesign requirements for sustainable products, amending Directive (EU) 2020/1828 and Regulation (EU) 2023/1542 and repealing Directive 2009/125/EC. http://data.europa.eu/eli/reg/2024/1781/oj

Regulation 1542/2023. Regulation (EU) No 2023/1542 of the European Parliament and of the Council of 12 July 2023 on concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC. http://data.europa.eu/eli/reg/2023/1542/oj

White papers:

Battery Passport Content Guidance. Achieving compliance with the EU Battery Regulation and increasing sustainability and circularity. V1.1. 2023: The Battery Pass consortium. https://thebatterypass.eu/assets/images/content-guidance/pdf/2023_Battery_Passport_Content_Guidance.pdf

JRC. 2024. Ecodesign for Sustainable products regulation: Study on new product priorities. https://publications.jrc.ec.europa.eu/repository/handle/JRC138903

Whitepaper Digital product passport (DPP) for construction products 09/2024. Bauen digital Scwiez. https://bauen-digital.ch/wp/wp-content/uploads/2024_09-Whitepaper_Digital-Product-Passport_EN.pdf

The FINNPASS workshops:

BizTech group kick-off, Data and competitiveness, 15.5.2024, Helsinki

BizTech group workshop, Technology perspective, 20.8.2024, on-line event

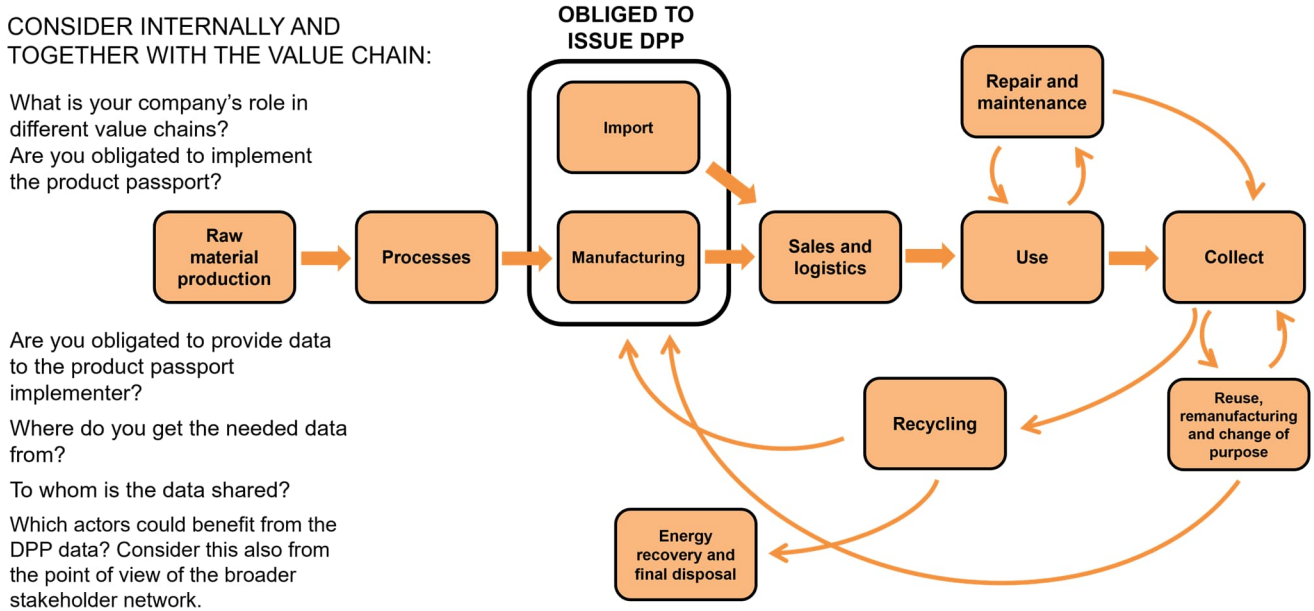
BizTech group workshop, Business perspective, 22.8.2024, on-line event

Battery Passport Workshop (invitation-only workshop for the actors of battery value chain) together with producer organisations Akkukierrätys Pb and Recser, 22.10.2024, Espoo

DPP mini exhibition, 5.11.2024, Espoo

Presentation and commentary of the FINNPASS playbook, 21.11.2024, on-line event

Appendix A: Practical tools for identifying 1) company roles in the value chain and 2) data sources and the role of in value chain management



The second tool is the matrix of the data flow (see below). It can be used to identify and write down essential data points in the DPP value chain. The matrix also helps to identify, who provides the data or where does my company get the data from. It is equally

important to consider who the data is shared with and who can also utilise the data (even if they do not necessarily need the data) for example to improve the operation of the value chain.

DPP data point	From whom or where does my organisation get the data?	To whom is the data shared?	Who can utilize the data?
e.g. Battery chemistry	Manufacturer	All (public data in battery passport)	Waste disposal operator

Appendix B: DPP Deployment in Practice: Insights from Finnish Solution Providers

The FINNPASS project collected information on current Finnish DPP solutions and developments based on a survey to provide an outlook to the status of the solutions available (fall 2024). Summary of the respondents (GS1 Finland, Ioxio, Kuurai, Lumoin, Second Thought, Solita, STRGL, and Twinbase) is provided below. We thank also the Finnish Tax Administration and Building information Foundation RTS for their insights.

1. What is the process of implementing a DPP solution and how long does it take?

The quickness of implementation depends on the company's data, such as what data already exists and what data is still missing, and its data capabilities. Implementation is accelerated if the data is in the right format and can be integrated from IT systems into the DPP via an API. The data-readiness level determines how to proceed. The DPP can be built modularly by utilising existing data to already create value from the early stages of the process.

There are different DPP solutions available. There is a so-called complementary solution, an end-to-end solution, which enables the sharing of product data at different stages of the life cycle and between data carriers. The solution utilises existing product identifiers.

Some solutions offer ready-made templates for certain product groups, so the work begins with completing the data fields. Some solutions start by selecting DPP properties and searching for value chain data. If the value chain data is not available, a value chain analysis can be carried out or the data can be collected using an Excel form. The duration of the work depends on the amount of data and the fragmentation of the data.

Some solutions integrate data from companies’ systems into the service provider’s platform. If companies do not have the necessary data, the platform supports companies and their partners in collecting the necessary data.

In some solutions, a company can join the DPP service by creating at least one integration through the developer portal. The company selects information products from the service provider's product library or, as a subcontractor, models that meet set requirements. The company can integrate its interface and make data available from its IT systems and its subcontractors’ IT systems. Subcontractors also perform a similar integration. Sensitive data can be managed and shared using the authentication built into the service.

The selected data carrier can affect the implementation's quickness so that a solution already in use can be integrated into the DPP solution more quickly. If implemented from the beginning, the process can take longer, especially if it includes system integrations.

2. What does the process require of me?

The DPP process requires an understanding of the forthcoming legislative requirements related to the DPP implementation and the associated digital needs. The process requires participation and cooperation with value chain actors and, if necessary, changes to existing information systems. Cooperation between different operations of the organisation is also likely to be needed so that product data is available for implementation.

Services have different operating methods for collecting product data. In any case, the customer is required to know what data it wants to include in the DPP and to be able to provide data from their IT systems. DPP data must also be kept up to date. In addition, data is needed from subcontractors.

3. What information do I need to have?

The requirements for the necessary data must be defined, for example, it may be basic product information and sustainability information. More detailed data content is determined according to the delegated regulations and the customer's business needs. Data that is not mandatory, but that supports the brand and facilitates the consumer's purchase decision can also be added to the DPP.

4. Can I add non-mandatory data fields that are important to me to the data model? Can the data model be updated later?

It is possible to add non-mandatory data fields to the data models. Data models can be updated later.

5. Will the solution be integrated into the company's internal IT systems?

In general, yes. Services can be integrated into the company's internal IT systems using interfaces.

6. How is data collected from the subcontractor network into the DPP?

Integrations between the operators' systems are the most efficient way to transfer data. For small operators, this is not necessarily an achievable option; in this case, data collection can be carried out using, for example, Excel, an online form or another method tailored to the customer.

7. Where is the data stored?

Different services store data in different ways. Data can be stored, for example, in the company's or its subcontractors' own IT systems, in cloud-based databases or services that enable centralised management and the sharing of data or on a platform provided by the service provider. Data can also be stored in a blockchain. Some services indicate that the data storage location is determined on a case-by-case basis.

8. How can I update the data?

Data is usually updated in the companies' own IT systems.

9. What does the service cost? How is the price determined?

In most services, the price is determined on a case-by-case basis. The price can be affected by, for example, the scope of the range (the number of integrated systems, the number of DPPs, etc.), the required dynamism, and possible additional needs. The price can also be affected by the level of granularity (i.e. whether a DPP is required at model, batch or item level).

Some services are priced on a monthly basis, some by product quantity. The service can also be free for the data provider, but the recipient of the data pays for the service. Some services offer product information providers the opportunity to receive a share of the platform's revenue through connected services when the product data provided has been utilised in circular economy applications.

10. How can my customer use the DPP?

The DPP increases transparency about the origin of a product, the materials used, the manufacturing process and other sustainability and environmental information. It also enables the development of existing and new digital business models, for example, models for consumers developed through circular economy applications. The DPP helps companies reduce the challenges of data collection and management by centralising product and supply chain data in one location.

Other benefits of the DPP include, for example, verifying product responsibility, accelerating certification processes, improving product traceability and creating digital services for physical products. The product passport information can be applied in Corporate Sustainability Reporting Directive reporting, customs services, financing, finding new partners, and in branding or dialogue with end users and customers.

Additional features have already been developed for some DPP services, such as direct integration into a resale platform or sharing product-related benefits with the

customer. In some services, it is possible to add images, videos, certificates, instructions, warranties, traceability data, website links, online store links, social media links and 3D models to the DPP service, making it a comprehensive and versatile way to manage and share product information and improve the customer experience.

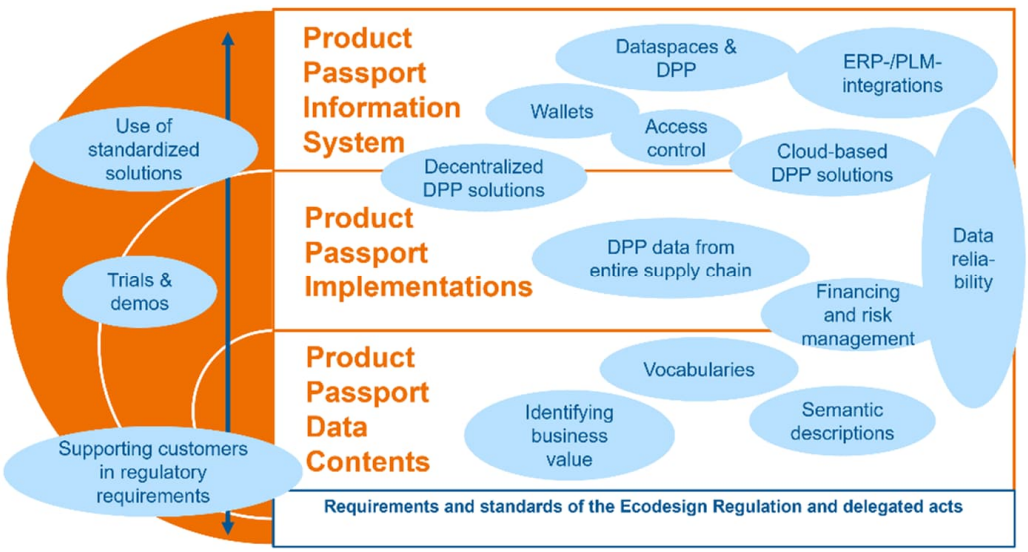
11. Does the service also include a data carrier?

This varies. Some services also include a data carrier. Some offer the service for use with the data carrier of the buyer's choice, and if necessary, a data carrier can be included in the service. Some services do not include a data carrier.

12. Can other DPP solutions read my data if I am a subcontractor for several customers?

Data can be shared between DPP solutions. Obligatory data can be read by anyone who is legally entitled to do so. In addition, who is granted access (obligatory data) to the broader data can be defined. On the other hand, successful data sharing also depends on the interoperability capabilities of the DPP solutions receiving the data.

Challenges remain and have been identified by the solution providers, see summary in the figure below; these include ensuring interoperability, reliability, and usability across different systems. Efforts are ongoing to remedy these, for example publicly funded efforts for creating vocabularies have emerged.



Appendix C: A Practical take on digital product passports in the Finnish construction sector

The real estate and construction sector: The DPP, PEPPOL and product data management. Written by Tommi Arola (Building Information Foundation RTS, February 2025).

The DPP is developing rapidly in the construction industry. The EU Construction Products Regulation was published in the Official Journal of the European Union on 18 December 2024. The regulation defines the implementation of the DPP system in the construction process and the general requirements. The DPP for construction products includes general product information, a declaration of performance and conformity, instructions for use and safety information, technical documents and unique identifiers. The recipient of the DPP must have easy access to this information free of charge. The DPP data must be based on open standards and must be prepared in an interoperable and machine-readable format. In addition to being machine readable, the DPP data must be structured, searchable and transferable via an open, interoperable data exchange network without vendor dependency.

In Finland, the infrastructure for a DPP related to construction is currently being built, focusing on the following: product individualisation and product information flow architecture, Peppol order-delivery messages and national product information services for construction products. Information flow architectures have been created for three different supply chain types in the construction process (Alhava et al. 2024) in the Construction Industry's order-delivery chain digitalisation project. This enables the integration of DPPs into operational processes, information flows and roles. The project is also currently promoting the application guidelines for product individualisation for concrete elements. A significant part of product individualisation consists of the product information services for construction products (Building Information Product Information, HVAC info, electrical numbers), which are part of the basic infrastructure of the DPP in terms of product content and harmonisation.

Construction order-delivery chains involve a lot of manual work and therefore it is important to connect all the parts of the digital infrastructure together to extract all the value from the DPP. For this reason, the real estate and construction industry has become active in the development of electronic Peppol order delivery messages and active in interoperability work. Under the leadership of the State Treasury, a Nordic construction Peppol industry forum has been established, which creates an exemplary role for Finland in creating a digital infrastructure for the product passport. Finland can also respond to the interoperability obligations of the EU DPP through semantic interoperability work led by the Ministry of the Environment. In cooperation with the industry, code sets, logical data models and vocabularies have been modeled for the use of the built environment industry;

these can ensure the logical structure of the core data of the DPP system between different actors, ranging from design to the building owner.

Appendix D: Two DPP implementations tested on MiniSuomi pilot development platform

MiniSuomi is a pilot development platform that enables testing of DPP implementation models. Two implementation options have been tested in MiniSuomi: 1) a model in which the DPP data is primarily in the blockchain and the company's identification information is retrieved from the company's business wallet (eIDAS 2.0 “EU business wallet”) and 2) a model in which the DPP consists of a single attribute certificate generated in the business wallet, which complies with the DPP data model developed by the UN's UNTP initiative. MiniSuomi pilot descriptions have been created by Mikael af Hällström, Finnish Tax Administration (March 2025).

1. What is the process for implementing a DPP solution and how long does it take?

The MiniSuomi pilot development platform has a ready-made MiniWallet digital wallet application, which allows you to test a DPP solution in the form of a verifiable credential with minor investment. A working demo of the DPP and its use can be created in a few workdays.

2. What does the process require of me?

An understanding of what data should be included in the DPP.

3. Can I add non-mandatory data fields that are important to me to the data model? Can the data model be updated later?

One starting point for a verifiable credential style DPP is the idea that the “core data” of the DPP would follow a certain standardised data model, such as the UNTP Digital Product Passport Vocabulary developed by the UN. By utilising this core data model as the basis for your own DPP, you can add your own fields to the DPP data model. The data model can be modeled for production use on the Interoperability Platform maintained by the Digital and Population Data Services Agency, but the same data model can also be used directly in MiniSuomi tests.

4. Will the solution be integrated into the company's internal IT systems?

A European digital wallet is being developed in connection with the implementation of the eIDAS 2.0 regulation. A proposal for a server-based wallet suitable for production use has been made in the EWC Large Scale Pilot, which pilot digital wallets. The EU Commission has recently announced that it wants to elevate the "EU Business Wallet" to a key digital building block in promoting the digitalisation of companies and business operations. If the business wallet in

question is implemented in accordance with the EWC's proposals, the wallet can be integrated into the company's own internal information systems as a server-based wallet.

5. How is data collected from the subcontractor network into the DPP?

According to the current understanding, a verifiable credential type DPP consists of several “attribute certificates” for a product, which are issued under a common product-specific umbrella by each party that has some influence during the product’s life cycle.

6. Where is the data stored?

Verifiable credential information can be stored either in a server-based wallet, blockchain, or in the company’s own IT systems, in which case the attribute certificate acts as an Internet link to the actual information in the DPP.

7. How can I update the data?

All parties who are defined in the product specific ecosystem as having the right to add their own product data as verifiable credentials to the information of an individual product.

8. What does the service cost? How is the price determined?

It is difficult to estimate the price of ready for production use service at the moment. MiniSuomi experiments can be carried out with a very small budget, either with your own developer resources or by reserving a separate budget for the acquisition of such a resource with the assistance of the Finnish Tax Administration (framework agreement arrangement).

9. How can my customer utilise the DPP?

By receiving upon request all product data in the form of a “verifiable credential” that the customer is entitled to see.

10. Does the service also include a data carrier?

The key element of the digital wallet solution is a JSON-format attribute certificate, which is protected by cryptographic means and electronically stamped to guarantee authenticity. The attribute certificate is obtained by requesting it from the company, e.g. by reading the QR code on the product, and the certificate is then transmitted in a so-called “verifiable presentation” to the requesting party’s own digital wallet (which will be a standardised mobile application for consumers).

11. Can other DPP solutions read my data if I am a subcontractor for several customers?

This has not been tested yet.

Appendix E: A summary of a product data sharing test using e-invoicing

E-invoicing as a minimum solution for the DPP is still awaiting real validation but based on the traceability experiment in the Real-Time Economy project, it appears that product data can be shared using e-invoicing. To achieve the level of reliability required by the DPP, further development work shall continue. For example, the code sets of public basic information registers must be brought to the level required by global trade. E-invoicing description provided by Johanna Kotipelto, Finnish Tax Administration (December 2024).

Integration: Original data can be company's internal data or references to basic registers of society. Product data can be included in the product catalogue of the PEPPOL procurement message.

Subcontractor network: The e-invoicing solution starts with the first source of data, which can be included in the invoicing and accumulated/enriched as an attachment to the e-invoice from one operator to another.

Data update: Data continues to be updated as an attachment to the procurement message: Seller's origin data 1 is updated in the timeline after the product reaches the Buyer as continued location data 2. If the product is still sold, the new Seller 2 transmits both original data 1 and 2.

Storage: The data is stored in the invoice attachment, which accompanies the product as digital data. This can be done either with an invoice or a waybill.

Appendix F: A step-by-step guideline for the DPP implementation

The key implementation actions companies should take to ensure compliance with DPP regulations are presented below in the form of four steps. Some of the actions are not strictly necessary but rather suggestions to consider, since they can significantly assist and simplify the management of DPP data. The steps are 1) prepare for DPP, 2) build interoperability and security, 3) choose data carrier and 4) manage EU registrations and DPP updates.

1. PREPARE FOR DPP
Identify the primary responsible individuals or entities within your company
Begin by designating a specific individual or department to oversee the DPP initiative. Clear ownership ensures accountability and streamlines communication. Potential candidates for this role include: **Product Manager**: Oversees product development and can integrate DPP requirements into the product lifecycle. **Sustainability Manager**: Focuses on environmental impact and can ensure the DPP aligns with sustainability goals. **Quality Manager**: Ensures product standards are met and can incorporate quality metrics into the DPP. **IT Department**: Manages data systems and can handle the technical aspects of DPP implementation.
Explore networks and partners supporting DPPs
Collaborating with suppliers, customers, and other stakeholders ensures a unified approach and resource sharing. Engage with industry networks, standardization bodies, and technology providers to stay informed about DPP developments. **Industry networks** such as Catena-X and the International Data Spaces Association (IDTA) support companies by offering training programs and onboarding services for seamless integration into the data space. In addition, they provide standardized data models and frameworks. **Standardization in CEN/CENELEC JTC24** creates harmonized standards for DPP system. The work of JTC24 happens through national standardization bodies (SFS in Finland). Also, StandICT.eu promotes DPPs by publishing comprehensive landscape analysis reports that identify and assess relevant standards on several fields related to DPP.

Ekosuunnittelu.info promotes DPPs by providing information on the European Commission's request for feedback regarding the rules for service providers related to DPPs, thereby encouraging stakeholder engagement in the development of DPP regulations.

The European Circular Economy Stakeholder Platform offers resources and networking opportunities for companies aiming to implement DPPs.

European research projects provide many viewpoints and the latest achievements to the DPP development. Especially CIRPASS and CIRPASS-2 are central, but there are plenty of others also e.g., CircThread, CircularTwAIn, TRICK, DaCapo, DigInTraCE etc.

Determine specific DPP data requirements for your product

Identify the data that needs to be collected and shared through the DPP, such as materials used, production processes, and environmental impacts. Initial DPP data requirements are discussed in Chapter 5.

Stay updated on relevant standards and forthcoming regulations.

Initiate early data collection

Begin by reviewing what data about your products and their manufacturing processes are already available and in which format. Key documents such as the Bill of Materials (BOM), manufacturing descriptions, or Life Cycle Assessments (LCA) can serve as a solid foundation for structuring the required DPP information.

Engage with your existing IT and system providers to explore what solutions they offer for implementing DPPs. Some enterprise resource planning (ERP) systems, product lifecycle management (PLM) tools, or supply chain management (SCM) platforms may already have modules or features that facilitate DPP compliance.

If relevant product data is scattered across different departments, stored in various formats, or even kept in paper-based records, work towards consolidating this information into a centralized digital format. A practical first step could be organizing the data in structured spreadsheets (e.g., Excel) or using cloud-based tools that allow easy access and updates.

Consider introducing digital product, project, or document management systems to streamline the handling, updating, and sharing of product data. These tools help ensure that data remains accurate, up to date, and accessible to relevant stakeholders, facilitating compliance with future DPP regulations.

Small-scale pilots help you prepare for the transition

Conducting small pilot projects can provide valuable insights and practical experience in managing DPP data before full-scale implementation.

Start by collecting the documentation by tracking information across the entire supply chain **for a single product**. This will help you understand how data is collected, shared, and utilized in real-world conditions.

Gather feedback from all stakeholders in the value chain, including suppliers, manufacturers, distributors, and even end users. Their input can highlight potential data gaps, process inefficiencies, or technical challenges that may arise when implementing the DPP on a larger scale.

A well-executed pilot project not only identifies areas for improvement but also generates new ideas for further development and integration. The lessons learned can help refine your DPP strategy, optimize data management practices, and ensure a smoother transition to regulatory compliance.

2. BUILD INTEROPERABILITY AND SECURITY

Establish or upgrade internal systems for DPP requirements

Establish or upgrade internal systems, including databases and enterprise resource planning (ERP) systems, to ensure they can collect and store data in accordance with DPP requirements. This involves structuring data in a way that facilitates both internal management and external exchange.

Using widely accepted file formats such as CSV or JSON enhances interoperability, making it easier to transfer information between different systems and stakeholders.

Standardized data formats not only improve efficiency but also reduce the risk of information loss or inconsistencies when integrating with external platforms.

A well-structured digital infrastructure ensures that product-related data remains accessible, up to date, and compliant with evolving regulatory and industry standards.

Additionally, it is good to consider the introduction of graph-based databases, because they can improve data integration, enhance search capabilities, and provide greater flexibility in managing interconnected product information. These technologies enable more efficient handling of complex relationships between components, materials, and lifecycle attributes, ultimately supporting a more robust and scalable DPP framework.

Establish efficient application programming interfaces for DPP

Investing in well-designed APIs is essential for enabling seamless data exchange between internal and external systems. Companies can enhance interoperability by implementing APIs that facilitate the integration of their data with suppliers' and customers' systems. This ensures that product information remains accessible and up to date across the entire value chain.

In addition to system connectivity, effective data linking is crucial, particularly for complex products composed of multiple components. Manufacturers must ensure that each part’s information is properly associated with the overall DPP, creating a comprehensive and structured dataset. By establishing clear relationships between product elements, companies improve traceability and support the accurate representation of a product’s lifecycle data within digital ecosystems.

DPP can facilitate sustainability reporting, such as CSRD, by providing data about product impacts. For full CSRD compliance these data must still be complemented by factory-wide data. Anyhow, efficient API interfaces, harmonized data models and standardized formats support also seamless ESG (Environmental, Social and Governance) reporting.

Ensure the quality and timeliness of DPP data

Companies must maintain accurate, complete, and relevant product data while ensuring full traceability. This requires the ability to verify the origin of each data element, track how it has been used, and document when it was last updated. Reliable data management practices strengthen trust in DPP systems and support compliance with regulatory and industry requirements.

In practice, companies can facilitate better data collection by deploying e.g. IoT sensors and smart tags for real-time monitoring, integrating production systems to automate data flows, and leveraging cloud platforms for scalable and secure storage.

To enhance consistency and interoperability, companies should adopt industry standards and structured data models. Standardized approaches facilitate seamless information exchange across different stakeholders and digital platforms.

Consider data security and access control

Companies must establish robust cybersecurity measures to protect product-related information from unauthorized access, manipulation, or data breaches. This includes implementing encryption, secure storage solutions, and regular security audits to ensure compliance with industry's best practices.

In addition to securing data, careful management of access rights is crucial. Organizations should define clear policies on who can view, edit, or share specific product data, ensuring that only authorized partners have access to sensitive information.

Role-based access control (RBAC) and authentication mechanisms help prevent unauthorized data exposure while enabling efficient collaboration within the supply chain. A well-structured approach to data security strengthens trust among stakeholders and ensures that DPPs provide reliable and protected information throughout a product's lifecycle.

GDPR (General Data Protection Regulation) becomes relevant to DPPs when these systems include or are linked to personal data, e.g. customer usage information. To comply with GDPR, DPP development must ensure that any personal data is processed lawfully and transparently, with strict access controls, data minimization, secure storage solutions, and robust consent mechanisms in place.

3. CHOOSE DATA CARRIER

Evaluate and choose an appropriate data carrier for your product

Key factors to evaluate include for instance:

Type: Common data carriers for DPP include QR codes, RFID (Radio Frequency Identification), and NFC (Near Field Communication) tags. The choice of carrier depends on the product's size, environment of use, and potentially established industry standards for product identification. For example, QR codes might be suitable for smaller products or items intended for customer interaction, while RFID or NFC tags are often used in industrial settings. Future use cases, such as automation in recycling or logistics, may also influence the selection of the most appropriate data carrier.

Capacity: The data carrier must have sufficient storage capacity to hold the necessary DPP information or provide a link to cloud-based data repositories. For instance, RFID tags often have larger data storage capabilities than QR codes, making them more suitable for products that require detailed, extensive offline information.

Updatability: If product information needs to be updated regularly (such as in the case of maintenance, recalls, or lifecycle tracking), RFID and NFC tags have the advantage of being able to store, update, and retain data locally on the tag itself. This offers more flexibility, durability, and, as an important feature for environments where continuous internet access is unavailable, offline accessibility for dynamic product data management.

Durability: The data carrier must be durable enough to withstand the conditions of the product’s usage environment. For example, RFID tags are typically more robust than QR codes, making them a better option for products subjected to harsh conditions, such as high temperatures, moisture, or physical impact. RFID tags can also have a longer lifespan, ensuring the persistence of data throughout the product’s lifecycle.

Data protection and access control: For sensitive data and higher security requirements, RFID and NFC tags can be more appropriate than QR codes. These technologies can support local encryption and access control mechanisms; thus, the tag itself can perform a check to ensure the scanner is authorized to access the data, without needing to connect to a backend system.

Company infrastructure and scalability: Companies should evaluate whether their existing infrastructure includes compatible readers for the selected data carrier. Scalability is also a consideration, as the chosen technology must be able to handle an increasing volume of products and data as the business grows. RFID and NFC systems may require additional investment in readers and software, but they offer greater scalability for larger operations.

Acquisition and operational costs: QR codes are cost-effective, particularly in high-volume applications. They can be generated easily and at a low cost, making them an attractive option for products that are distributed in large quantities. On the other hand, RFID and NFC systems may involve higher

initial investment but offer long-term benefits in terms of automation and security.

User-friendliness: QR codes are highly user-friendly for consumers, who can easily scan them using smartphones to access product information. In contrast, RFID and NFC are more suited for professional settings where dedicated scanning equipment is available. The user experience must be considered based on the target audience of the product.

Standards: The data carrier must comply with industry-specific standards and interoperability requirements to ensure that the DPP data can be accessed and used across different platforms. For instance, RFID tags must meet the relevant standards set by the International Organization for Standardization (ISO) to ensure global compatibility.

Legislation: Privacy regulations, such as the GDPR, can influence the choice of data carrier. While in many cases a link to a DPP server in a data carrier might be sufficient, there are cases when the data carrier may need to store additional, possibly sensitive, information to ensure product traceability without dependence on real-time internet access. In these cases, data carriers should be capable of ensuring the secure handling and storage of personal data.

Environmental considerations: Companies may be driven by sustainability goals when selecting materials for data carriers. For example, environmentally friendly and recyclable materials may be preferred for QR codes, while in long-term, high-durability applications, RFID/NFC tags might reduce waste and support circular economy models better.

Circular economy requirements: In automated recycling processes, data carriers that allow remote reading of DPP data can significantly enhance operational efficiency. RFID or NFC technology is often more suitable for this purpose as it supports long-distance data transmission, which can facilitate seamless integration with recycling systems.

4. MANAGE EU REGISTRATIONS AND DPP UPDATES

Address EU DPP backup and registration requirements

In late 2025, the EU plans to set regulations detailing key components of the DPP system. These will encompass the creation of the DPP registry, guidelines for service providers, standards for product identifiers, specifications for data carriers, and protocols for digital credentials. EU DPP registry will function as a centralized database that stores product related identifiers and also a link to the backup copy of DPP data provided by a third party service provider. The DPP registry can be used e.g. by customs for automatic verifications about DPP existence and authenticity. The registry will be connected to the EU DPP web portal which will allow searching and comparing DPP data also by consumers.

For businesses, there are some actions to take:

Creation of a backup copy of a DPP and storing it to the data store provided by a third-party service provider.

Registration of key DPP identifiers (product identifier, economic operator identifier, facility identifier, registration identifier, commodity code) to the EU DPP registry. Also, a reference to the DPP backup needs to be stored in the registry, because it ensures that, in cases where the original DPP becomes inaccessible, authorities and other stakeholders can retrieve the necessary product information from the backup.

However, when creating identifiers, it is important to adhere to the compliant identifier formats required by the registry. Details for the formats and interaction procedures with the DPP registry will probably be published in late 2025. The latest regulation information can be found e.g. through Ekosuunnittelu.info websites.

Ensuring updates and long-term availability of DPP data

Companies must ensure that product information remains accurate and up to date throughout the product's entire lifecycle:

This includes guaranteeing that the data registered in the DPP system is accessible over the long term.

It is highly plausible that the EU will provide a centralized or coordinated service to ensure long-term accessibility and backup of DPP data, but the specifics are still in development.

In DPPs, maintaining the level of accuracy requires continuous updates to product data. Businesses should plan how to regularly update information and assign responsibility to the relevant stakeholders.

It is also essential to monitor the evolving landscape of regulations and standards, as DPP requirements may change over time, reflecting new legislative and environmental demands.

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Title	**Implementing the digital product passport - A guidebook for businesses**
Author(s)	Jaana Keränen, Inka Orko, Kristiina Valtanen & Maria Åkerman
Abstract	A digital product passport (DPP) is a digital description of a physical product. It includes information on the materials, manufacturing, repair, use and disposal of the product, defined by the type of product. The goal of the DPP is to extend the lifespan of products and promote their circular economy by providing standardised product data. The DPP will be mandatory for a large part of the products manufactured in and imported into the EU, with a phased rollout schedule for different product groups. The EU Ecodesign of Sustainable Products Regulation sets the frame for the DPP requirements and will be complemented by product-specific delegated acts. The first DPPs should be available by 2026-27. The DPP requirements will impact the product manufacturers and importers as well as their value chains in many ways. They are required to provide data for further support more sustainable product designs and use patterns over the product life cycle, for improved supply chain management, and for new business opportunities. While mandatory, the DPP opens multiple new business opportunities and business models in the form of sharing platforms, predictive maintenance services, refurbishing etc. On the other hand, the increased information demand will require planning, management and collaboration internally and through the value network and will also take up resources, especially in the first implementation phases. Thus, it is advantageous to take charge of the DPP and start preparing and piloting early on. This guidebook will complement other DPP publications already available, with the emphasis of providing considerations and a practical roadmap for the implementation. A particular target group are small and medium size businesses that may have limited resources for the DPP. A collective understanding and shared goals and collaboration are needed across the ecosystem, including the DPP beneficiaries, product owners, data management and service providers to build a coherent, reliable and relevant DPP system.
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Nimeke	**Digitaalinen tuotepassi - Opas yrityksille**
Tekijä(t)	Jaana Keränen, Inka Orko, Kristiina Valtanen & Maria Åkerman
Tiivistelmä	Digitaalinen tuotepassi (DPP) on fyysisen tuotteen digitaalinen vastine. Se sisältää tietoa tuotteen materiaaleista, valmistuksesta, korjauksesta, käytöstä ja hävittämisestä. Tuotepassin tavoitteena on pidentää tuotteiden elinikää ja edistää niiden kiertotaloutta tarjoamalla standardoitua tuotetietoa. Tuotepassi tulee olemaan pakollinen suurelle osalle EU:ssa valmistetuille ja EU:hun tuoduille tuotteille. Tuotepassin käyttöönotto etenee tuoteryhmittäin. EU:n kestävien tuotteiden ekosuunnitteluasetus säätää puitteet tuotepassivaatimuksille ja sitä täydennetään tuotekohtaisilla delegoiduilla säädöksillä. Ensimmäisten tuotepassien pitäisi olla saatavilla vuosina 2026-27. Tuotepassivaatimukset vaikuttavat tuotteiden valmistajiin ja maahantuojiin monin tavoin. Tuotepassien odotetaan tarjoavan tietoa ja työkaluja kestävämpään tuotesuunnitteluun, toimitusketjun hallinnan parantamiseen ja uusiin liiketoimintamahdollisuuksiin koko elinkaaren ajalla. Vaikka tuotepassi on lainsäädännön vaatimus, se avaa useita uusia liiketoimintamahdollisuuksia ja -malleja esimerkiksi jakamisalustojen, ennakoivien ylläpitopalvelujen ja kunnossapidon ympärille.Toisaalta lisääntynyt tiedon tarve vaatii suunnittelua, johtamista ja yhteistoimintaa arvoverkostossa ja edellyttää myös resursseja, erityisesti tuotepassien ensimmäisessä toteutusvaiheessa. Onkin kannattavaa aloittaa tuotepassin valmistelu ja pilotointi ajoissa. Tämä opas täydentää muita jo saatavilla olevia tuotepassijulkaisuja painottaen käytännön etenemissuunnitelmaa. Oppaan keskeisenä kohderyhmänä ovat pk-yritykset, joilla voi olla rajalliset resurssit tuotepassien toteutukseen. Yhteistä ymmärrystä, yhteisiä tavoitteita ja yhteistyötä tarvitaan kaikkialla ekosysteemissä, mukaan lukien tuotepassien hyödyntäjät, tuotteiden omistajat, tiedonhallinta ja palveluntarjoajat, jotta voidaan rakentaa yhtenäinen, luotettava ja relevantti tuotepassijärjestelmä.
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