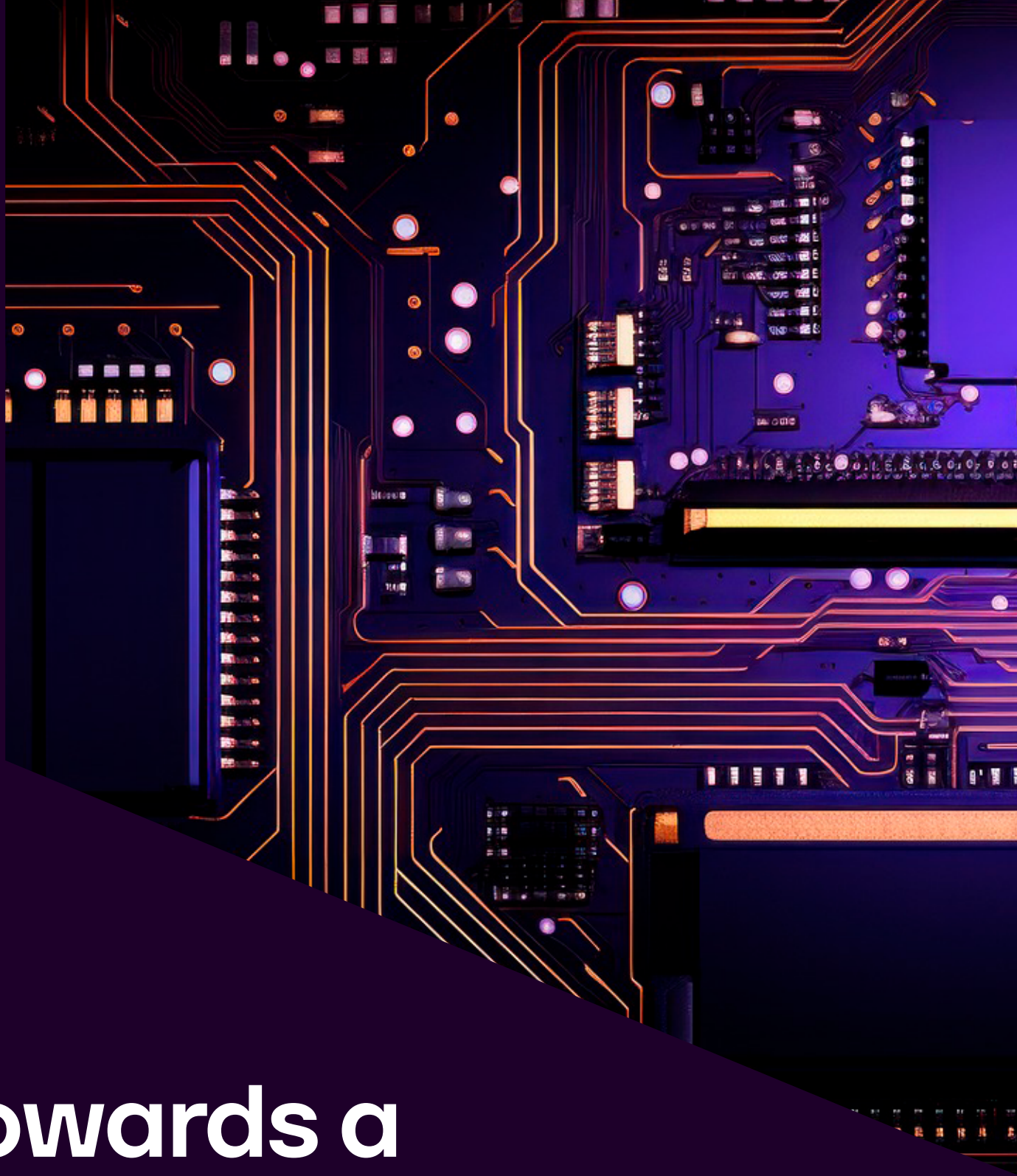


Towards a Digital Value Chain

From Technical Possibility to Practical Reality Introduction

Technology Industries of Sweden · Mobility Sweden · ChainTraced · GS1 Sweden · SSAB · VOLVO

REPORT

Table of Contents

Introduction

The shift to a digital value chain is a decisive transformation for industry, driven by both regulatory requirements and growing demands for sustainability and transparency in the market. This report highlights that digitalizing the value chain is not primarily a technical challenge, it is equally an organizational and cultural one. Success requires new working methods within companies, but above all, active knowledge-sharing and collaboration across sectors, industries, and stages of the value chain.

This report is primarily directed towards decision-makers, company management, industry organizations, authorities, and other stakeholders affected by, and interested in the digitalization of product information. Our ambition is to provide a basis for strategic discussions, workshops, network meetings, policy development, internal training and creating consensus around the organizational and cultural challenges, while presenting concrete steps forward to facilitate the transition to digital value chains. Cross-industry networks and forums where companies can learn from each other, build trust around data sharing, and maintain close ties with research projects will further facilitate the process. The purpose of our report is however not to analyze information management in detail, but to describe how a culture of openness and learning supports the development of joint action plans and collaborative projects.

The time to act is now. The first requirements for digital product passports (DPP) will soon take effect, and more product categories will follow. Sharing and utilizing product data will thus become a central part of industry's ability to meet demands for sustainability and circularity. The pressure comes not only from EU regulations but also from market expectations. However, the key sucess factor is clear; focus on business value. When business value is evident, compliance will follow.

The report also stresses the importance of including small and medium-sized enterprises (SMEs) in the transition. Larger companies have a responsibility to help and engage their supply chains, explain why this matters, and demonstrate the concrete benefits of participating. By including SMEs in joint forums and collaborations, we can achieve broader consensus and a more effective transition to a digital value chain.

In summary, the report aims to inspire organizational change, collaboration, and strategic work to create an efficient and sustainable digital value chain – where technology is an enabler, but success is determined by the ability of people and organizations working together and learning from each other.

1. Facts and Concepts

Digital Product Passport (DPP)

A digital representation of product information intended to collect and structure data about a product's properties, environmental performance, safety, and compliance. The DPP is linked to the product via a unique identifier and makes information available to actors throughout the value chain. DPP is introduced as a central tool in several new and upcoming EU legislations, including the Ecodesign Regulation (ESPR) and Construction Products Regulation (CPR). These regulations require product information to be digitally accessible and traceable, focusing on both sustainability and product safety. Similar requirements are expected to be gradually introduced in more product areas, and DPP is planned to become the primary carrier of product information in all relevant product legislation going forward. DPP enables increased transparency, circularity, and regulatory compliance, while facilitating information exchange between companies, authorities, and consumers.

DPP system

A standardized framework for managing information in a digital product passport (DPP). It describes data storage, access, security, interoperability, and the connection between the physical product and digital information. The aim is to ensure that DPP operates uniformly, reliably, and traceably throughout the EU. The framework is technology-neutral, meaning it is not dependent on any specific technical solution, platform, or operator. This allows flexibility and adaptation to different industries, systems, and actors, while ensuring that information can be shared and used fairly and transparently.

EU Green Deal

EU's strategy to achieve climate neutrality by 2050. It includes measures to reduce emissions, protect biodiversity, promote a circular economy, ensure sustainable industry, and social justice. Initiatives include Fit for 55, the EU Taxonomy, CSRD (sustainability reporting), and ESPR (Ecodesign Regulation).

EU Clean Industrial Deal

A strategic plan building on the Green Deal, aiming to accelerate the transition to a climate-neutral and competitive industry in Europe. The initiative combines climate action with efforts to strengthen industrial resilience, innovation, and independence. The Clean Industrial Deal focuses particularly on energy-intensive industries and the development of clean technology, aiming to lower energy costs, promote circular solutions, and reduce dependence on imported raw materials. Through extensive investments and new legislative initiatives, such as the Industrial Decarbonisation Accelerator Act and Circular Economy Act, the Clean Industrial Deal aims to create better conditions for European manufacturing, innovation, and sustainable growth. The strategy is a central part of the EU's path to climate neutrality by 2050 and complements the Green Deal by making industrial transformation a driver for both the environment and competitiveness.

SME

Small and medium-sized enterprises. According to the EU definition, small enterprises have fewer than 50 employees, while medium-sized enterprises have between 50 and 249 employees.

2. Background

While order and logistics data are already structured and automated and can automatically flow through business systems in the value chain, other information such as sustainability data often remains unstructured, incomplete, or entirely missing. Therefore manual handling is needed for such data to be effectively shared and used.

The DPP system provides the technical infrastructure for managing digital product data and is based on international standards. However, since the standards can be interpreted differently between industries, obstacles can still arise and create barriers to interoperability.

To enable interoperable and efficient data flow, common definitions and concepts are essential. Yet, the system must be sufficiently flexible to accommodate the needs of different actors in the value chain, without requiring major changes to existing processes or systems.

An open flow of product information between actors in the value chain creates opportunities, such as automation of information management, easier purchasing, and improved product quality. Based on current experience, the main obstacles to achieve this are organizational, cultural, and legal, rather than technical. Protecting trade secrets and other intellectual property remains a critical concern.

To achieve a functioning digital value chain, increased cooperation between different industry players is needed, as well as close dialogue with policymakers and the public sector. Public sector involvement is vital, not the least given its role as major purchasers of industrial products and its responsibility to maintain, preserve and safeguard data quality and suppor circularity

3. Regulatory Drivers

An important part of the EU's Green Deal is to move from a linear to a circular economy, thereby creating a society where resources are used more efficiently. Products should be designed for durability, repair, and recycling, with a strong focus on minimizing resource use. A key factor in this transition is traceability, which will be addressed through the introduction of DPP.

The EU's Clean Industrial Deal further emphasizes the importance of circularity, not only for the environment but also as a strategic issue to secure Europe's access to materials in times of geopolitical uncertainty. By promoting circular flows and recycling, dependence on imported raw materials is reduced and Europe's resilience to disruptions in global supply chains is strengthened.

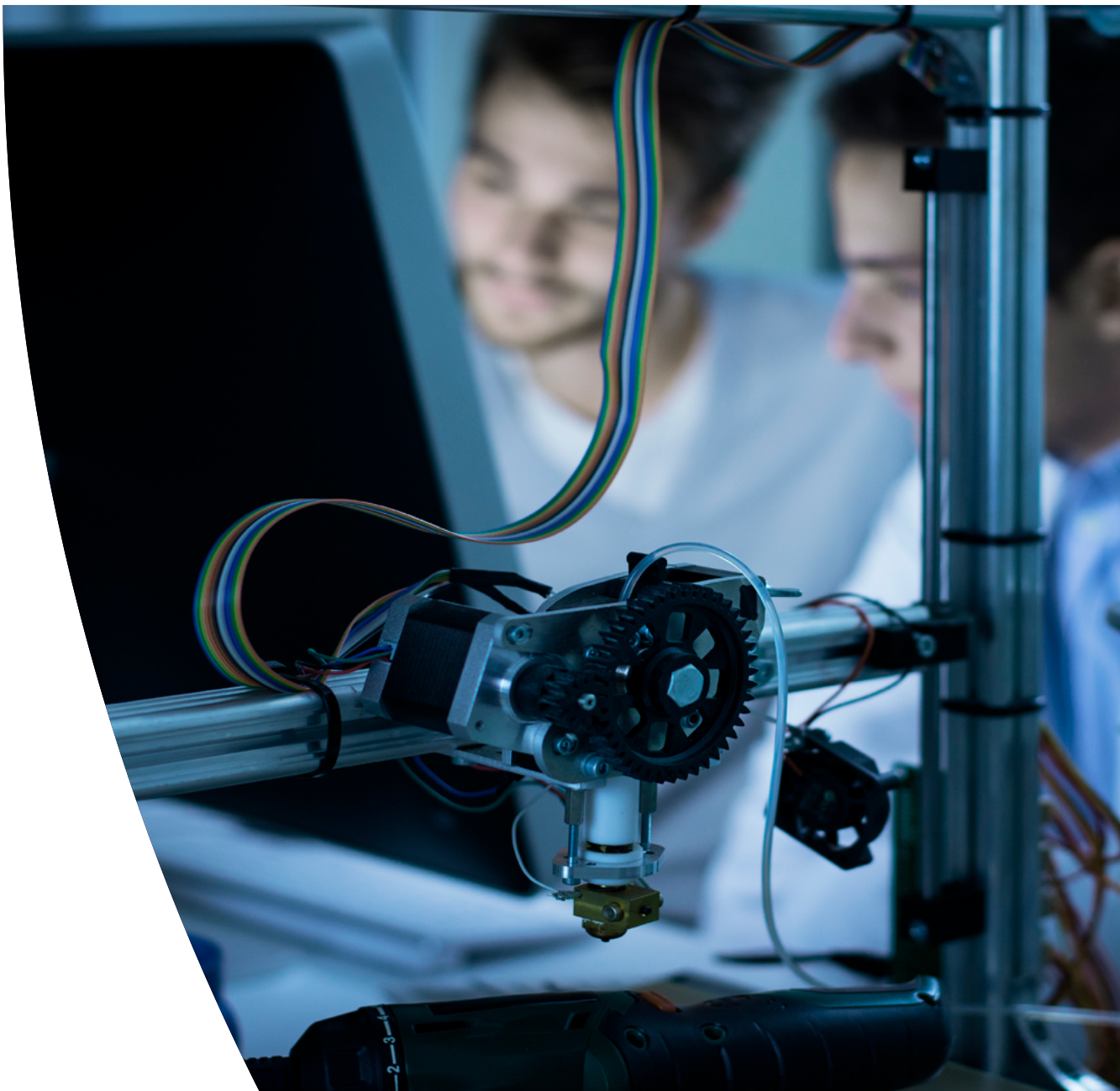
Although the requirements to provide information via digital product passports (DPP) are currently mainly found in sustainability legislation, DPP is already used to convey other product information within certain regulations. In the Construction Products Regulation (CPR), Battery Regulation, and Ecodesign Regulation (ESPR), DPP includes requirements forand performance data, material content, in addition to environmental and sustainability data. These legislations have been decided, but DPP will begin to be applied no earlier than 2027.

This means that information such as climate impact, material content, safety data, and CE marking may be included in DPP depending on product category and legislation. User manuals are not yet a mandatory part of DPP, but within the ongoing Omnibus IV proposal, the possibility of digitally distributing such documents via DPP is being discussed.

In addition to the decided legislations, there are other regulations where DPP is proposed or discussed as a future possibility. As more product legislations introduce requirements for DPP, additional types of product information are expected to be gradually included and harmonized across industry boundaries.

The EU's requirements for sustainability data reporting and the introduction of digital product passports (DPP) are examples of regulations that require detailed information about products and operations. Similar initiatives exist in Canada, the USA, Brazil, and Australia, as well as in multilateral forums such as the UN. To meet requirements for digital product information, companies must be able to trace and share data about the product's origin, materials, environmental impact, and use. At the same time, information flows in the value chain must be flexible, as different markets' regulatory systems will not necessarily require the same data points.

It is important to take a holistic view so that we do not end up with requirements for different information sources for different legislations. Without a holistic view of data, there is a risk that information is handled multiple times and/or that the same information is required by several different legislations.



4. Practical Challenges in the Value Chain

Description of Value Chains for Different Industries

Generally, for manufacturing industries, information that can currently flow automatically through the value chain is logistics and order information. Other information, such as origin and sustainability data, is normally handled manually, if it is even available. A key issue for business is the management of business-critical information and the ability to conceal sensitive information. Therefore, it is important that all work with data harmonization is based on information security and protection of intellectual property.

Automotive

Here, the vehicle manufacturer becomes a central node for information. As the leading party in the value chain, the manufacturer acts as a hub for managing data both internally and across the entire value chain. Since suppliers, workshops, dismantlers, and recyclers typically work with several different car brands, the information must be standardized, with minor regional variations and more significant differences at the global level.

Defence

Here, the value chain is more complex with many subcontractors and system suppliers. For the defence industry, it is particularly important to manage access rights and to be able to conceal sensitive information. At the same time, many "civilian" components are used within the defence industry, so the interface between industries must be well adapted to handle both the free flow of information and confidentiality requirements.

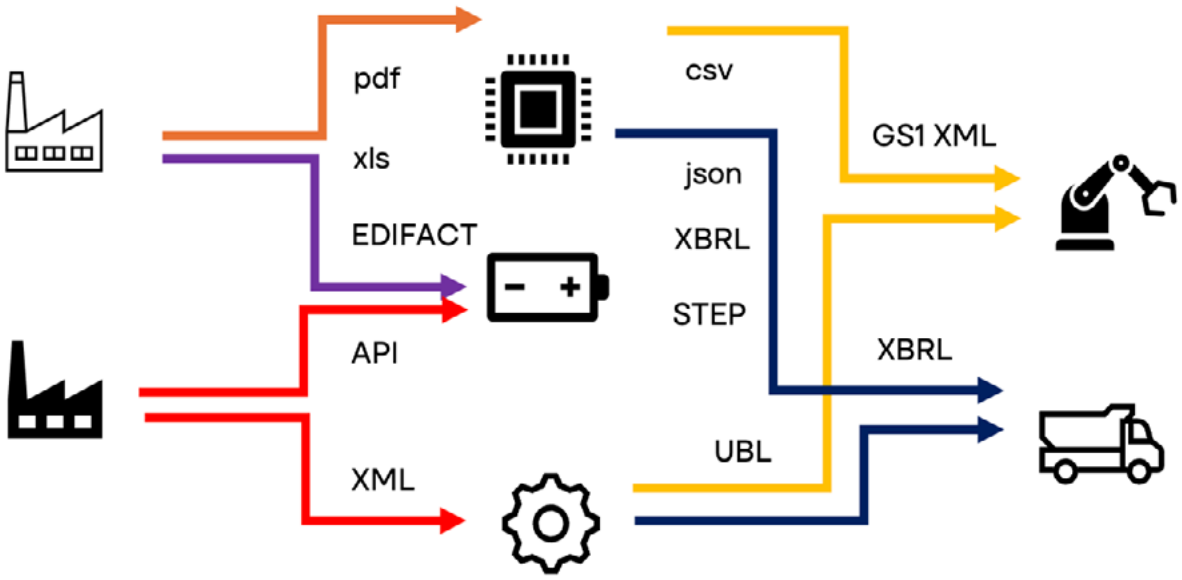
Other Industry

Here, there is a need to harmonize and standardize data and definitions. Traditionally, there has not been a great need to coordinate with others, as these companies often have unique product categories, unlike the automotive industry. There seem to be few synergies between companies that manufacture household appliances and those that manufacture mobile machinery, even though many components may be the same.

Construction

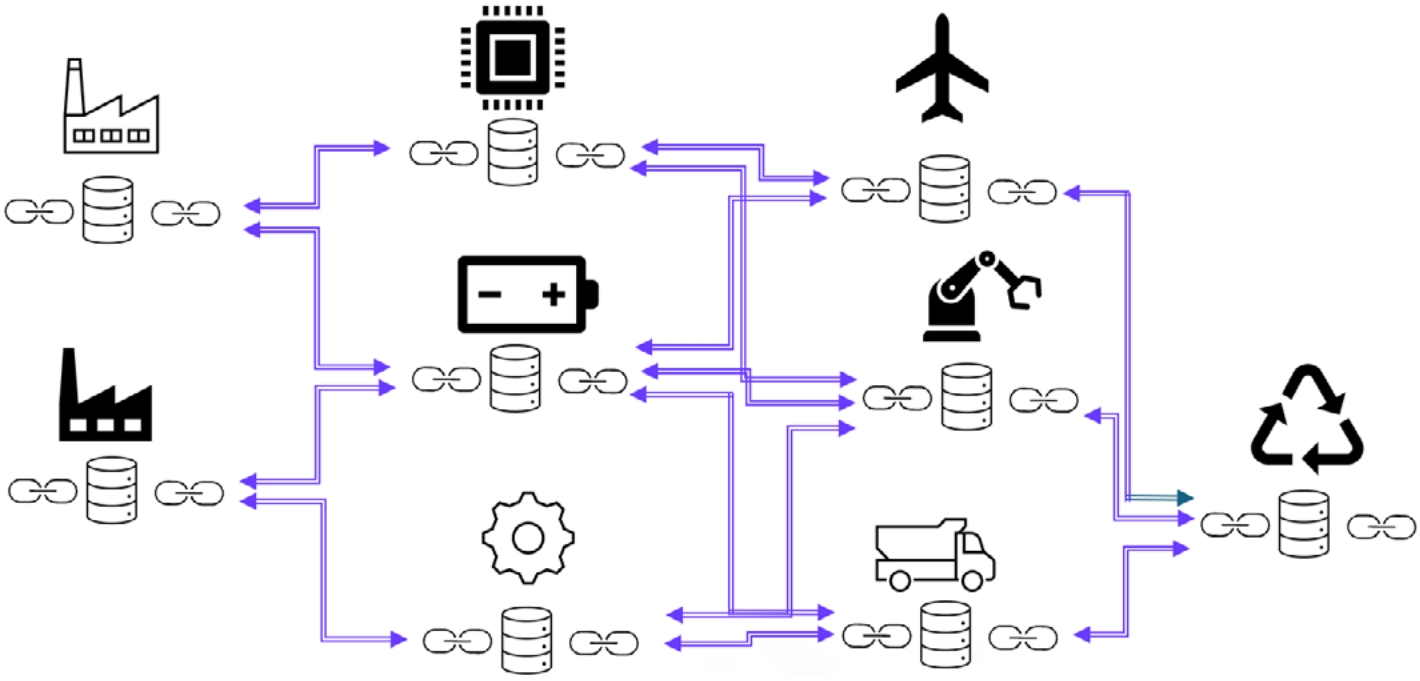
Here, there is a complex and to a large extent a national value chain for building materials, and a parallel situation where many products are both B2B products purchased by large companies and consumer products sold in regular hardware stores. In Sweden, there is some digital handling of purchasing flows with a combination of product databases and EDI, and there are many Swedish and European projects underway to improve efficiency and traceability through digitalization.

Mapping of value chains for automotive, defence, and other industrial sectors shows that information flow is fragmented. The information that currently flows automatically and digitally is, with few exceptions, linked to logistics and order information.



Figur 1. Example of how the situation may look today, where different actors use their own formats and different methods for transferring data. Even if the system works, it is sensitive to disruptions and highly inflexible.

In today's setup, each actor manages and stores their data in isolated systems. This fragmentation makes it difficult to share information efficiently across the value chain. With a linked data approach, actors can continue to store their own information, but instead of exchanging copies of one another's data, they reference the original source maintained by whoever created it. This reduces duplication and lowers the risk of inconsistencies, while also introducing a greater need for trust and confidence in data security. Although the technical safeguards for secure data access are well established, users must feel reassured that linking to externally hosted data is both safe and reliable.



Figur 2. A schematic illustration of what an infrastructure using linked product data could look like. Data remains where it is created, and other actors in the value chain link to that data. This provides a level of flexibility that does not exist today and creates significant opportunities for automating information management.

Data is also handled in silos, both between and within companies. Contributing factors include that information may be defined differently by different actors and across sectors.

Sustainability data is a relatively new area, which often means data is missing or that measurement or calculation methods do not yet exist. This results in poor data quality and limited reliability.

While the lack of data and weak data quality are problematic, they also indicate that by addressing these issues, we may also improve the quality of the product itself. This creates a direct link to the business value of better structured data and greater transparency in the value chain.

Complex products often rely on multiple tiers of subcontractors, each with their own information needs. This can make it difficult to ensure that relevant data is carried forward through the value chain. If a subcontractor has no immediate use for certain information, it is unlikely to be passed on unless a contract explicitly requires it. If that information is needed later—for example due to a new regulatory requirement—retrieving it can be time consuming or, in some cases, impossible.

Beyond the challenge of obtaining data in complex value chains, duplicating information for local storage also increases the risk of inconsistencies—the classic “telephone game.” A linked data approach can help address this: actors only need to access the information that is relevant to them, directly from the source where it is maintained.

5. Identified Challenges

During the project discussions, several challenges related to the implementation of DPP systems have clearly emerged.

- Business-critical information is often unclearly defined and proprietary, which complicates collaboration.
- Integrity and access issues make data sharing difficult, especially between actors without a direct business relationship.
- Unstructured data (non-point data) is difficult to handle without common technical and semantic solutions.
- For SMEs, it is important that the “approval/assessment” of new suppliers can be harmonized as much as possible. Today, it can be administratively burdensome to be approved as a supplier to larger companies, for example due to strict sustainability or quality requirements. This process is usually manual and done via forms or contracts.

  Services or modules that handle data according to different standards, and that harmonized initiatives must be anchored organizationally – not just technically – including with IT service providers. The lack of coordination of standardization and frameworks is a central obstacle to effective traceability and interoperability.

To move forward, the following activities have been identified:

- Develop a harmonized model for data in the value chain. Key considerations include agreeing on which framework the model should be based on, and how we can practically work towards a consensus solution.
- Ensure company leadership engages internally, so that different functions—procurement, R&D, sustainability, IT, and sales—begin collaborating and organizing around data sharing.
- As the harmonization work begins, it is important to identify and prioritize the data that actually creates business value. This also includes clarifying the value for each actor in the chain — which types of data matter most for subcontractors, component suppliers, manufacturers, recyclers, and other stakeholders.

  The participants expressed a clear need for a joint cross industry forum — a place where actors can share experiences and learn from one another. Since subcontractors and downstream actors in the value chain often operate across multiple sectors, cross industry collaboration becomes especially important.

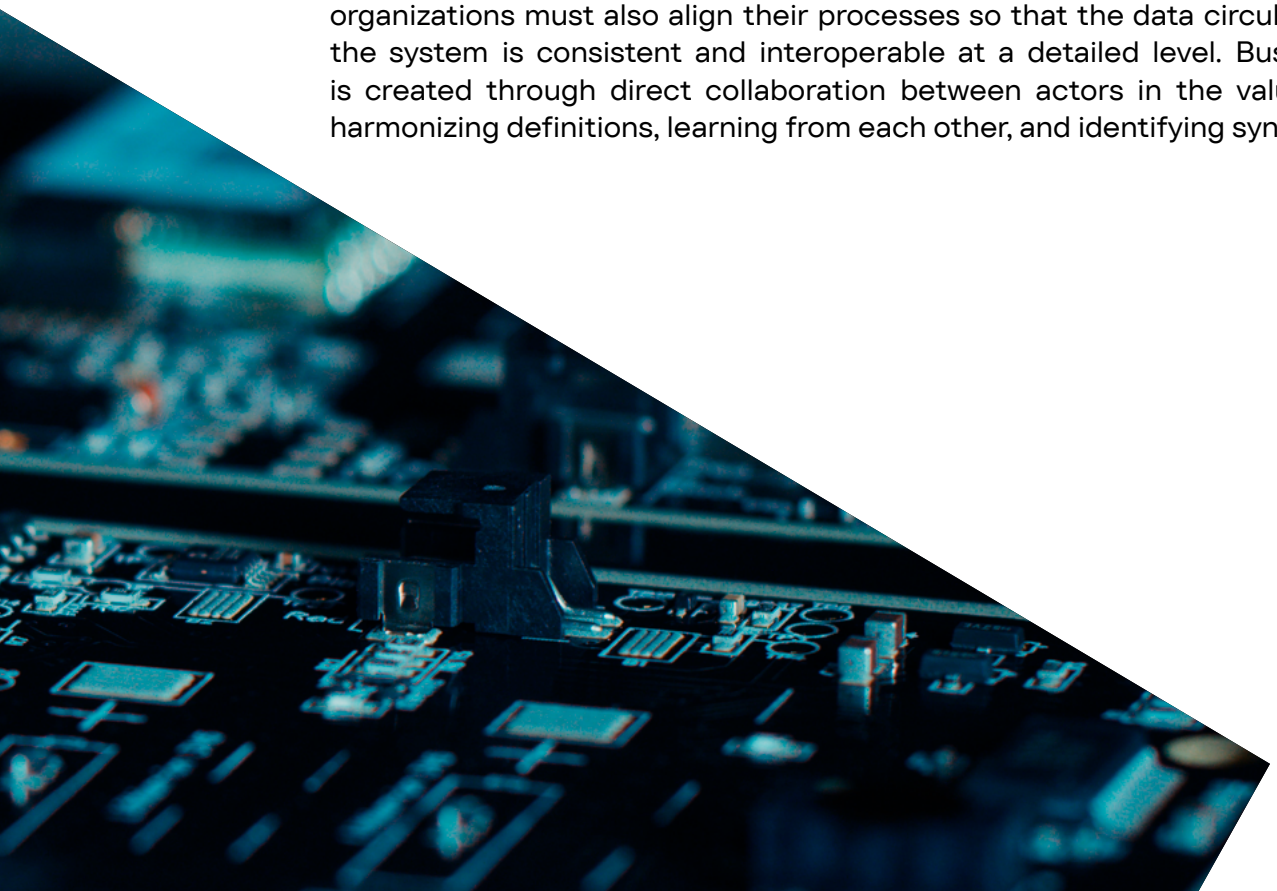
6. Conclutions and Discussion

Cross-industry collaboration offers significant benefits; by learning from each other we can achieve an effective transition to a decentralized infrastructure for product information.

A common but decentralized infrastructure can unlock significant business value. By further automating our purchasing processes, we can markedly reduce the administrative burden of regulatory compliance and at the same time build more flexible and interoperable IT systems. Moreover, greater traceability delivers substantial long term quality benefits, enabling us to follow the product further along the value chain and make more informed, data driven decisions.

There are also advantages in resilience and crisis preparedness by using a common and decentralized data infrastructure. The risk of data breaches and information theft is reduced as the information is not stored in just one place, but each actor ensures the storage and availability of their own information. Linked data also enables rapid detection of deviations, while standardized protocols and access controls protect sensitive information. A common way of managing data also makes it easier to find critical products and parts.

Common standards are important for establishing a framework for how information exchange should function, and that work is now proceeding according to plan. However, having standards that define the infrastructure does not automatically ensure seamless information exchange across the value chain. To achieve this, organizations must also align their processes so that the data circulating within the system is consistent and interoperable at a detailed level. Business value is created through direct collaboration between actors in the value chain by harmonizing definitions, learning from each other, and identifying synergies.



We need to build trust in this new way of managing data. We are used to “own” the data in our systems, and the idea of relying on linking to other for data may be worrying. There is a need for information to be developed that describes how data is secure and protected in the DPP system.

Discussions often start from regulatory requirements, which is of course relevant. But we also need to broaden our perspective and identify what creates value in adopting a shared view of data across the value chain. By shifting our mindset and recognising that, if we build an information flow capable of automating information management and functioning across industries, we will likely also be able to automate the information required for regulatory compliance. In parallel with the work of identifying business value in data, we need to map our value chains and learn from one another, ideally through cross-industry networks. Bigger companies need to consider how they can facilitate for smaller ones, as many of their subcontractors are SMEs. In addition to facilitating information about what data is needed and taking into account SMEs’ technical capabilities to handle data, it would be beneficial if they would also simplify the approval process for new subcontractors. The legal requirements on large companies often trickle down to their subcontractors. These subcontractors often receive extensive contracts with requirements that they have to meet, and the contracts are not aligned. Making the requirements more harmonized would make it easier for SMEs.

Industry has a responsibility to drive the work with a cross-industry value chain, but the public sector also plays an important role. It is a major purchaser of various industrial goods and therefore also need to adapt its data flow so that no information is lost. In addition, the public sector should be a role model, as the main reason for developing an interoperable and cross-industry value chain is upcoming legal requirements, including the Ecodesign Regulation, Construction Products Regulation, and Battery Regulation and their requirements for digital product passports.

SMEs face particular challenges in the transition to digital value chains. Larger actors have a responsibility to take the lead, explain why the issue is important, and demonstrate the concrete value of participating. By including SMEs in joint forums and collaborations, they can gradually be brought into the new logic and help build the critical mass needed for success.

The introduction of digital product passports is not primarily a technical issue. It requires organizational change, collaboration, and strategic work. Companies that act now can not only achieve compliance but also strengthen their competitiveness and contribute to a sustainable future.

Proposed Next Steps

- Companies need to review collaboration between purchasing, R&D, sustainability, IT, logistics, sales, and compliance. This includes harmonizing the way data is managed and classified, how data is stored, and naming conventions.
- IT service providers must be involved early. However, companies need to ensure that their own data management is in place before IT solutions are developed.
- IT solutions should be based on modules that can handle different data standards.
- Trust in decentralized data. It may feel insecure to only link to source data, especially when it comes to compliance data. Here, both information efforts and technical measures may be needed.
- Ideally, the technical solution should be based on the organization's working methods and not the other way around. Adapting the organization to a technical solution is rarely effective. At the same time, the organization needs to adapt to a new data-focused way of working and not just to the flow of materials.
- The public sector also needs to be involved in this work, as they are a major purchaser of products and materials, where product information must be managed in the same way so that information is not lost to actors further up the value chain, such as repairers and recyclers.
- SMEs will depend on IT providers to manage their data in a DPP system. They will need support in setting the right requirements for these IT providers.
- At the same time as work with data and product information begins internally in companies, we need to create networks where companies and organizations can learn from each other. These should be cross-industry and preferably have close contact with research in the field.

This report is intended to be used as a joint starting point for establishing cross-industry forums and networks where actors can share experiences, identify common challenges, and develop forms of cooperation. It can also be used as a basis for workshops to map current challenges and develop strategies to streamline information flows in the value chain. A concrete example is to use the report as a basis for discussions on how different actors can collaborate to meet upcoming regulatory requirements for digital product information.

This report has been jointly developed by Assa Abloy, ChainTraced, GS1, Husqvarna Group, Mobility Sweden, SAAB, SKF, SSAB, Technology Industries of Sweden och Volvo Group.

Technology Industries of Sweden

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