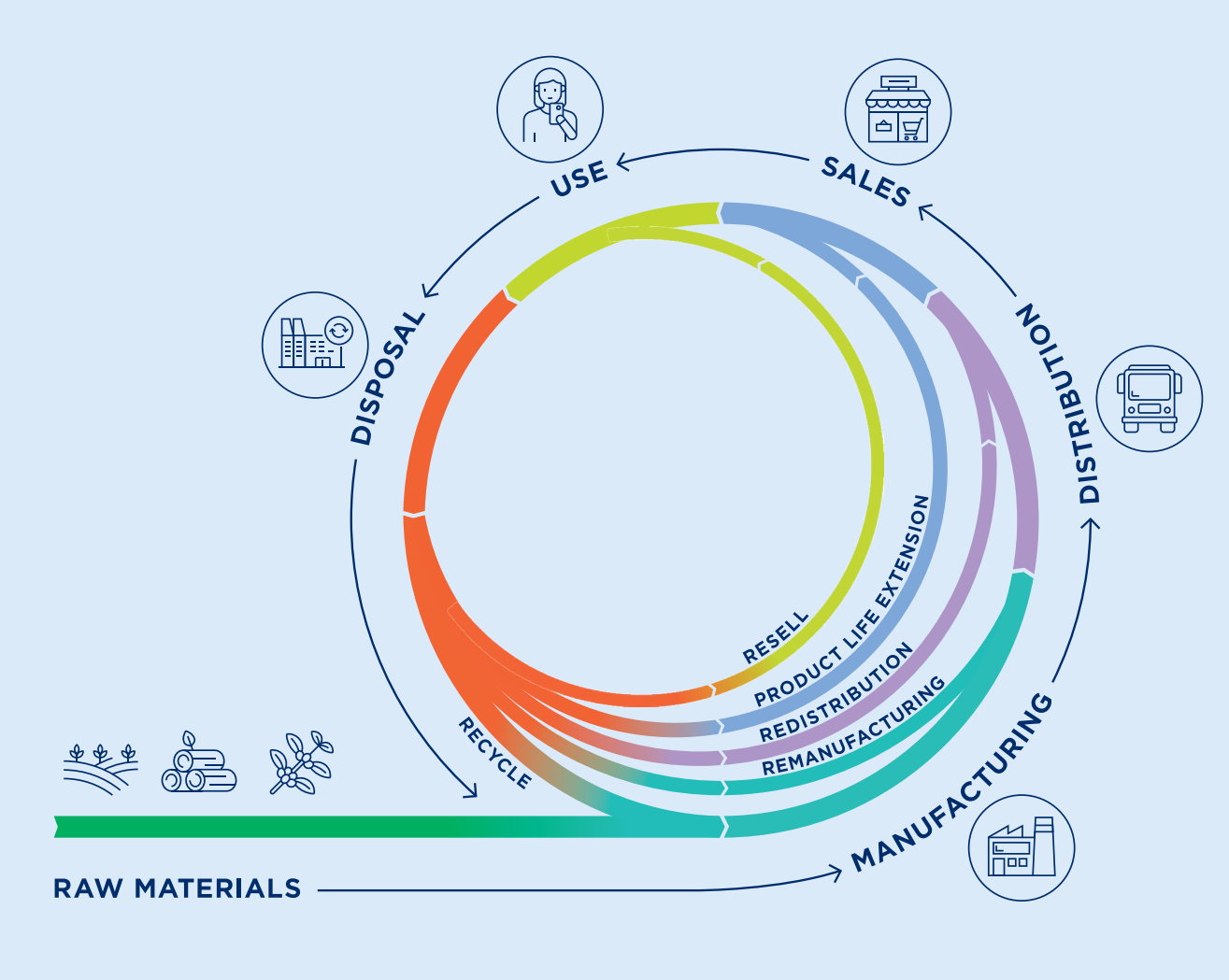
GS1 Sweden

The Global Language of Business

Digital Product Passport and GS1 Standards

An introduction to structure, identification and data sharing in the value chains of the future



Foreword

This handbook is written for people who need to understand Digital Product Passports (DPPs) in their real-world context. It is intended for those who work with products, data, standards, sustainability, business development, regulations or digitalisation, and who have encountered DPPs but need to understand how it all goes together.

The starting point is simple: a DPP is not merely a new information interface or a new regulatory requirement. It is a new way of organizing the relationship between a physical product, its digital identity, data and responsibility. For many organisations, this means that areas previously managed separately must now work together.

Three fundamental ideas

The first is that DPPs need to be understood both as a regulatory concept and as a practical structure. The Ecodesign for Sustainable Product Regulation (ESPR) makes DPPs relevant from a regulatory perspective, while the European DPP standards make it possible to translate the requirements into technical and organisational solutions. Within this overall structure, EN 18219 and EN 18220 are particularly important, as they address how products, economic operators and locations are identified, and how the physical product is connected to digital information through data carriers, such as a QR code.

The second is that many economic operators are not starting from scratch. Several industries already have established structures for identification, marking and information exchange. GS1 standards are therefore particularly relevant in a DPP context, because they cover identification, data carriers, master data and information exchange, and have been developed to support interoperability in open value chains.

The third is that early choices have long-term consequences. Choices concerning the identification model, granularity, data carrier, linking, data model and responsibility are not isolated technical questions. They affect investments, the ability to collaborate, risk levels, flexibility and the possibility of creating value beyond basic regulatory compliance.

The handbook therefore does not approach DPPs as a buzzword or an isolated digitalisation project. It begins with the underlying problem that DPPs are intended to solve in a more sustainable, regulated and interconnected economy, products need to be understood digitally in a significantly more robust way than before. It is no longer sufficient for products merely to be manufactured, sold and used. They must also be identifiable, describable, traceable, shareable and manageable throughout their entire lifecycle in a way that works for multiple actors, across multiple systems and over longer periods of time.

A DPP is not merely a new information interface or a new regulatory requirement. It is a new way of organising the relationship between a physical product, its digital identity, data and responsibility.

The handbook is therefore structured as a gradual progression. It first addresses how a product is given an identity. It then describes how that identity is made usable through data carriers and linking. This is followed by an examination of how information about the product can be structured, used between actors, followed over time and governed through clearly defined responsibilities. Finally, the handbook discusses implementation, business value, ecosystems and the long-term infrastructure required for DPPs to work in practice.

The objective is not to provide a technical description of DPPs. The objective is to provide a comprehensible way into the decisions that economic operators need to make.

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Introduction

Why products need a digital structure

The meaning and value of products are changing. They are no longer merely physical objects that are manufactured, sold and used. They are also becoming sources of information, responsibility and future opportunities. In an economy characterised by increasing requirements for sustainability, transparency and collaboration, products need to function in more contexts than before. They must not only fulfil a function here and now but must also be understood in relation to their origin, content, use and continued life after the initial sale.

Digital Product Passports have therefore not emerged in a vacuum. They are a response to this change in how products are used and understood within the economy, regulation and value chains.

For a long time, the dominant logic was sufficient: a product is manufactured, distributed, sold, used and replaced. Information about the product has been functionally divided between different actors and systems. The manufacturer has managed technical specifications, the distributor has managed logistics information, the retailer has managed commercial attributes and authorities have managed certain compliance data. If each actor primarily needed information for its own purposes, this division was manageable.

However, that logic is no longer sufficient.

As products are increasingly expected to be repairable, upgradable, reusable, resellable, disassemblable and recyclable, it is not sufficient for information to exist locally or temporarily. It must be able to follow the product over time, be understandable in multiple contexts and be available to different actors with different needs. It is not only the amount of information that becomes important, but also its structure, semantics and continuity.

This is the background against which the need for a new way of organising product information has emerged.

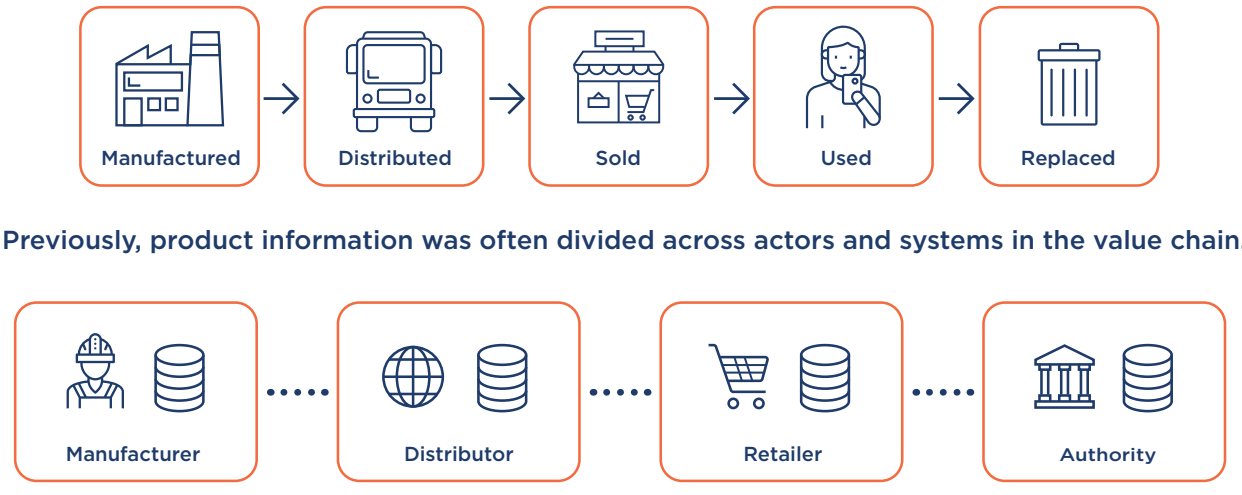


Figure 1. Product information was previously divided between actors and systems.

From fragmentation to continuity

The fundamental problem is not lack of data. Many organisations and value chains already have large amounts of product information. The problem is instead that the information is often:

- distributed across several systems,
- structured in different ways,
- adapted to local needs,
- difficult to reuse outside its original context,
- difficult to connect to the physical product in a long-term and reliable way.

This means that the digital description of a product rarely has the same stability as the physical product itself. Information is created, moved, duplicated and reinterpreted, and sometimes loses its clear connection to the object it refers to.

It is precisely this lack of information continuity that Digital Product Passports are intended to address.

Digital Product Passports should therefore not be understood as yet another isolated document or merely as a collection of data. Rather, they are a way of establishing a more coherent digital structure around the product, in which identity, access, the data model and responsibility for information are connected in a way that keeps product information usable over time.

DPP as a concept established through regulation

It is important to understand that DPPs did not initially emerge as technical standards, but as a regulatory and political response to a growing need.

Within the framework of the EU Ecodesign for Sustainable Products Regulation (ESPR), DPPs have been established as a central tool for supporting a more resource-efficient and circular product market. In this context, DPPs become a means of making product information more accessible, more traceable and more useful to a broader range of actors. It is therefore not merely an information requirement, but part of a broader transition and transformation in which products need to be understood from the perspective of their entire lifecycle, rather than only at the point of sale.

This also means that DPPs have, from the outset, been closely connected to issues such as:

- sustainability performance,
- repairability,
- upgradability,
- material content,
- reuse,
- recycling.

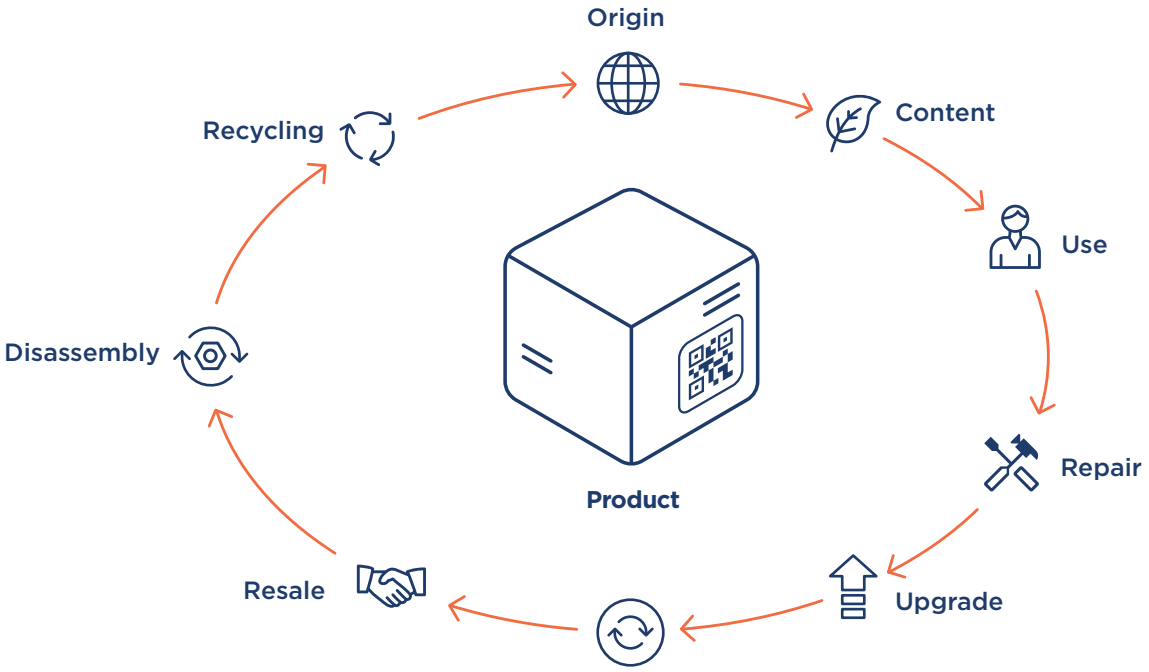


Figure 2. New and expanded use cases will need to be supported in the future.

From ESPR to broader application

Although DPPs have their clearest starting point in ESPR, it is misleading to view the concept as being limited to that particular regulation. As the logic becomes established — that products need a robust digital information structure — it also becomes relevant in other product and regulatory areas.

This is because the fundamental question is general: if a physical product is to be better understood, assessed and managed throughout its life, there must be a stable relationship between the product and its information. This applies regardless of whether the primary purpose is environmental performance, safety, market surveillance, recycling, repair or supply-chain transparency.

DPPs should therefore be understood both as a concept established through regulation and as an emerging model for future product governance more generally.

Why harmonized standards become critical

Once the need for DPPs has been established, the next central question arises: how can this be made achievable in practice? A Digital Product Passport cannot function merely as an idea or a policy ambition. It must be translated into solutions that are technically robust, understandable to multiple actors and capable of being used at scale. This is where the harmonised standards become important.

Without standardisation, each economic operator would, in practice, need to develop its own model for identification, data carriers, access to information, data sharing, traceability, storage, security and trust. The result would be a patchwork of local solutions in which every exchange of information between two actors required adaptation, translation or manual interpretation. Such a development would make DPPs expensive to implement, difficult to scale and weak as a shared regulatory tool. The European DPP standards therefore exist to transform the concept from a regulatory ambition into a functioning and shared structure.

Within this structure, eight standards have been developed to support the DPP system as a whole:

- EN 18219 – unique identifiers,
- EN 18220 – data carriers,
- EN 18216 – data exchange protocols,
- EN 18222 – APIs for lifecycle management and searchability,
- EN 18223 – system interoperability,
- EN 18221 – data storage, archiving and data persistence,
- EN 18239 – access management, information security and business confidentiality,
- EN 18246 – data authenticity, reliability and integrity.

Together, these standards describe the broader DPP architecture. Some address access and technical interfaces, while others address storage, security and trust. However, two are particularly fundamental because they establish the starting point that enables everything else to work: EN 18219 and EN 18220.

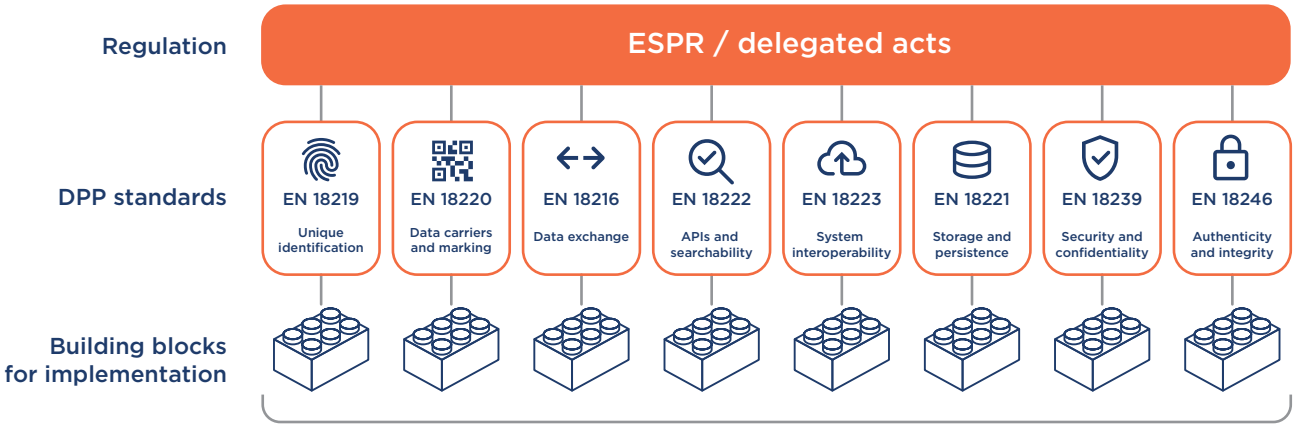


Figure 3. European standards as building blocks for an interoperable and reliable DPP.

EN 18219 – identity as the foundation

EN 18219 is central because it establishes what a product identity must actually be capable of achieving. The standard covers not only products, but also economic operators and facilities or units. It describes six core principles: global uniqueness, persistence, syntax, granularity, interoperability and openness. In practice, these principles define what is required for an identifier to remain usable over time, understandable in multiple systems and shareable between multiple actors without losing its meaning. The standard also clarifies that, depending on the need, the product identifier can be designed to function at model, batch or individual-item level.

This means that EN 18219 does not merely describe "a number or a code". It describes the conditions that enable an identity to be connected to a broader digital structure. Without such an identity logic, the rest of the DPP becomes unstable.

EN 18220 – connecting the identity to the physical product

EN 18220 takes the next necessary step. While EN 18219 addresses what the identity is, EN 18220 addresses how the identity becomes practically usable. The standard covers data carriers and describes how a unique product identifier can be represented and made available through, among other things, 2D codes or RFID. It addresses requirements for encoding, readability, marking, placement, quality and durability, and clarifies that at least one data carrier must be physically present on the product, its packaging or accompanying documentation. It also emphasises that the data carrier must function in real-world usage environments and that public information must be accessible without requiring the end user to use dedicated DPP-specific software.

Together, EN 18219 and EN 18220 therefore form the first structural core of DPP implementation: first identity, then linking and finally marking. The product must first be given a stable and shareable identity. That identity must then be carried in a way that allows the physical product to be machine-read and connected to its digital information, enabling data sharing, traceability, storage, security and trust. The result would otherwise be a patchwork of local solutions.

The role of the other standards

Once the identity and data carrier are in place, the DPP perspective expands to include how the information is to function within a broader system. This is where the other standards become important.

- EN 18216 addresses how information can be exchanged between actors in a consistent manner.
- EN 18222 focuses on the APIs required to manage DPPs throughout the lifecycle and make the information searchable.
- EN 18223 addresses how different systems can function together without losing meaning or functionality.
- EN 18221 addresses how DPP information is stored, preserved and kept available over time.
- EN 18239 concerns access, security and the protection of sensitive or business-critical information.
- EN 18246 addresses how the authenticity, reliability and integrity of information can be ensured.

Together, these standards make a DPP more than an identification solution. They create the conditions required for information not only to exist, but also to be shared, used, preserved and protected in a way that works in real product and information flows.

DPP is therefore not primarily about more data

It is essential not to misunderstand a DPP as a project for collecting larger quantities of data. The amount of information is not the main issue. The central question is instead how product information can be made usable in a broader context than the system in which it was created.

An important change is that product information no longer needs to be sent, reported and adapted separately for every authority, customer or other recipient. Instead, the information can be created and managed once, and then made available to those who need it, with the appropriate access and level of information. This shifts the focus from repeated reporting to shared access to information.

This requires at least four things:

- that the product can be clearly and persistently identified,
- that the identity can be made accessible from the physical product,
- that the information is structured so that others can understand it,
- that it can be shared, managed and preserved without losing meaning or reliability.

A DPP should therefore be understood as a combination of technical structure, information model and governance principles. This is precisely what makes the concept more demanding than traditional product data management — but also considerably more strategic.

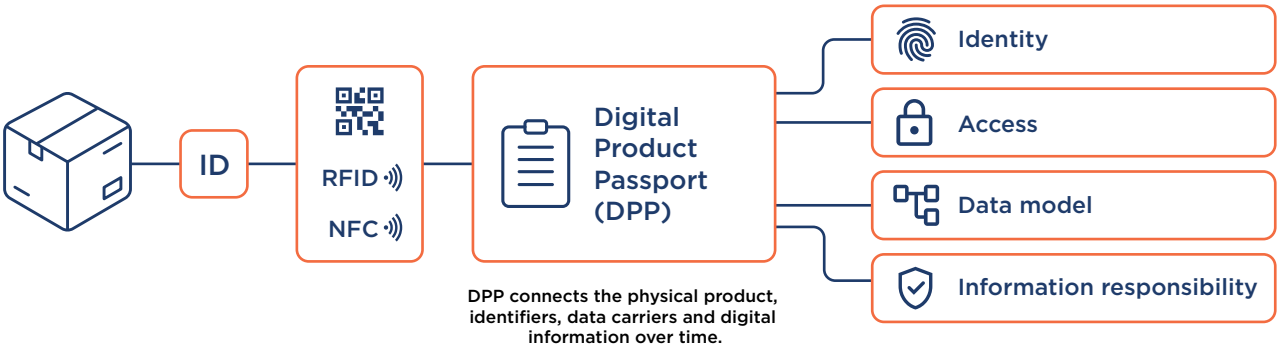


Figure 4. DPP connects the physical product and information over time.

What this means for economic operators

For an economic operator, a DPP does not merely mean that new requirements must be met. It also means that several fundamental questions need to be reconsidered.

Many organisations already have an approach for identifying products, marking them and managing information about them. However, in a DPP context, it is not sufficient for these solutions to work internally. They must also function in a broader context in which the information can be understood and used by more external actors over time.

This raises several important questions. For example, an organisation needs to decide whether it should build on the identity structures it already uses or introduce new ones. It also needs to determine the level at which products should be identified: is identifying a model sufficient, or is there a need to distinguish between batches or individual items? The organisation must also consider which type of data carrier is most suitable, based not only on technical possibilities but also on how the product is actually used, handled and moved throughout its lifecycle.

This is the context in which GS1 becomes relevant. Not as a synonym for DPP, and not as a mandatory choice in every situation, but as an already established system for several of the building blocks that a DPP requires: identities, data carriers, master data and information exchange. For many organisations, this means that DPP implementation does not need to start from scratch. Instead, it can begin with a qualified analysis of what already exists, what already works and what needs to be developed to meet a more comprehensive DPP logic.

Chapter 1

The Foundation of DPPs: How Products Are Connected to Data

Chapter Overview

This first chapter has a limited but crucial purpose: to demonstrate that DPPs begin with order and consistency in product identity. If the identity is weak, everything built on top of it becomes more expensive, more uncertain and more difficult to develop. If it is strong, the organisation gains a foundation for marking, linking, data sharing, traceability and future development. This is why this chapter must come first. Before the product can be described, followed and understood digitally, it must be clear which product the information actually relates to.

Information has been functionally divided between different actors and systems. The manufacturer has managed technical specifications, the distributor has managed logistics information, the retailer has managed commercial attributes and authorities have managed certain compliance data. As long as each actor primarily needed information for its own purposes, this division was manageable.

1.1 Why begin here?

To properly understand Digital Product Passports, it is necessary to begin in the right place. It is easy to be drawn immediately to QR codes, databases, APIs, information models or regulatory requirements. However, before any of these become meaningful, there is a more fundamental question: how do we know that the right information actually belongs to the right product?

It is a simple question, but in practice it contains the entire starting point for DPPs. If the relationship between the physical product and its digital information is unclear, several problems arise simultaneously. Product data can become mixed up. Two actors may believe that they are referring to the same product when they are actually referring to different objects. Historical information and traceability become uncertain. The ability to build on the structure with, for example, sustainability information, repair data or recycling support becomes weaker than it may initially appear.

Product identity is therefore not a technical detail alongside the DPP. It is the first building block in the entire structure. Without a clear identity, there is no stable point to which all further information can be connected.

1.2 The product and the information often exist in different worlds

Most organisations already have large amounts of product information. This is rarely where the problem begins. On the contrary, many companies have built up extensive information environments around their products over a long period of time.

The challenge is instead that the information is often distributed and used for different purposes in different parts of the organisation. The same

product may appear as an item in an ERP system, as an object in a PIM or PLM environment, as a code on the packaging, as a line in logistics information, as an entry in sustainability data and as a document in technical documentation.

As long as each system is used for its own purpose, this may function relatively well. An enterprise resource planning system does not necessarily need to know exactly how the same product is described in technical documentation, provided that each environment performs its intended task. The problem arises when the product needs to be understood in a broader context in which multiple actors, systems and use cases need to meet around the same object.

The central question is then no longer whether the information exists, but whether it is clear which product the information refers to. This is precisely why DPPs begin with identification rather than information visualisation. Before data can be shared, compared, traced or used strategically, it must be clear what the data concerns.

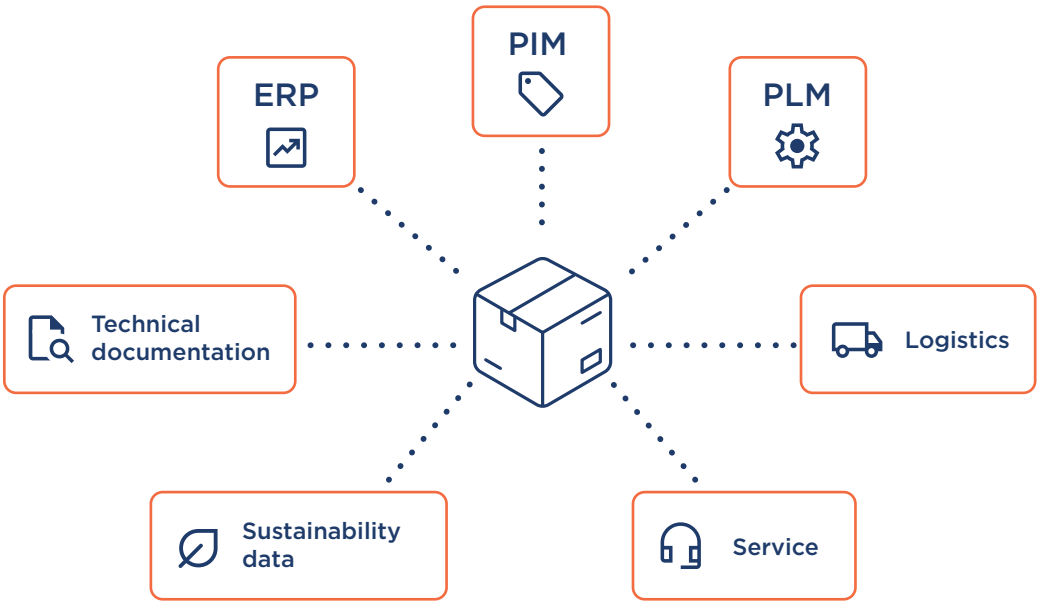


Figure 5. Starting point — information exists, but the connection to the product may be ambiguous or weak.

1.3 From an internal product key to a shared reference

Many companies already have internal product numbers or item identifiers. These fulfil important functions and should not be underestimated. They are often well adapted to the company's own operations and can be essential for planning, logistics, order management and internal control.

However, an internal number is not automatically suitable as the foundation for a DPP. The difference can be described simply: an internal identifier helps the organisation itself to work efficiently, while a product identity for a DPP must help multiple actors understand the same product in the same way.

An internal identifier helps the organisation itself to work efficiently, while a product identity for a DPP must help multiple actors understand the same product in the same way.

This means that DPPs impose higher requirements than traditional internal product governance. The identifier needs to be sufficiently clear to distinguish the product from other products. It needs to be sufficiently stable to remain valid over time, even as systems and processes change. It also needs to be sufficiently well defined to be used by actors other than the one that originally created it.

An internal identifier helps the organisation itself to work efficiently, while a product identity for a DPP must help multiple actors understand the same product in the same way.

In practice, this means that a product identity in a DPP must not merely function as an internal identifier, but as a shared reference point in a broader information landscape. It is this shift — from internal function to open structure — that makes the question of identity so central.

1.4 What usually goes wrong

When organisations begin to analyse their current product identities, they often discover the same types of problems. It is important to recognise them early, as they may otherwise be carried into the DPP implementation and create friction later on.

- The same product has several identities. One product number is used in one system, another by a partner and a third on the packaging.
- The identifier requires internal knowledge. It is meaningful to those who work closely with the product, but difficult for others to interpret.
- The identity changes when systems or processes change. This makes historical information and traceability uncertain.
- The identification is too broad or too detailed for its purpose. In some cases, only the model is identified when a batch or individual item should have been identified. In other cases, an unnecessarily high level of detail is introduced without a clear business need.
- The physical product and its digital representation are not sufficiently well connected. This weakens the link between the product and the data.
- The same identity may accidentally be used by another company for an entirely different product.

None of this is unusual. On the contrary, it is precisely these recurring weaknesses that cause the DPP standards to place such importance on the fundamentals.

1.5 What DPP requires from identification

The identification requirements can be described without beginning with formal standards terminology. In practice, a robust product identity in a DPP needs to answer four questions:

1. Is it clear which product the identifier refers to?
2. Can multiple actors use the same identity?
3. Will the identity remain valid over time?
4. Can the identity be included in a data carrier in practice?

The first question concerns clarity. It must be possible to distinguish the product from other products; otherwise, it becomes uncertain which information actually belongs to which object. The second question concerns shared usability. If the identity only works within a single system or a single organisation, it is too weak for a DPP, as the concept is based on multiple actors being able to use the same product identity. The third question concerns stability over time. If the identity changes easily when systems, processes or organisational circumstances change, the entire information chain becomes unstable. The fourth question concerns practical usability. The identification must not only work in theory, but must also be usable in data carriers, systems and information exchange.

Together, these four questions provide a practical interpretation of what a robust DPP identity needs to achieve. It therefore needs to be more than theoretically correct. It must also function in real flows, for real users and over real periods of time.

1.6 Why standardisation becomes critical

As long as a company only works within its own systems, it can often resolve product identity in its own way. However, as soon as multiple actors need to collaborate, new costs arise for translation, mapping, verification and error handling.

This is when standardisation becomes critical.

Standardisation does not mean that all companies must use identical systems or work in exactly the same way. It does mean, however, that they need to build on shared principles for how products are identified and described.

When this works, several benefits arise simultaneously. New actors can connect with less adaptation. Information exchange becomes easier to automate. The risk of misunderstandings is reduced. Investments also become more sustainable over the long term because they are based on a logic that works outside the organisation's own system landscape.

Standardisation in a DPP context should therefore not primarily be understood as a regulatory requirement. It is equally a way of creating economic and operational sustainability in information management.

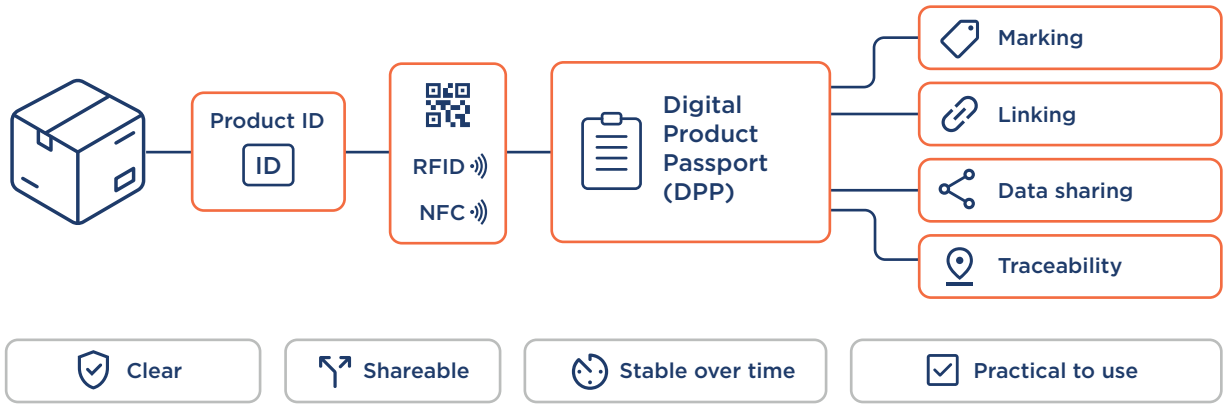


Figure 6. When the identity is strong, it becomes easier to build upon it.

1.7 GS1 as an established system to build upon

This is where GS1 standards become practically relevant. For many economic operators, GS1 is already part of everyday operations, even if they do not always think of it in those terms. Product identification, barcodes, 2D codes and certain information flows already rely on GS1 standards in large parts of trade and logistics.

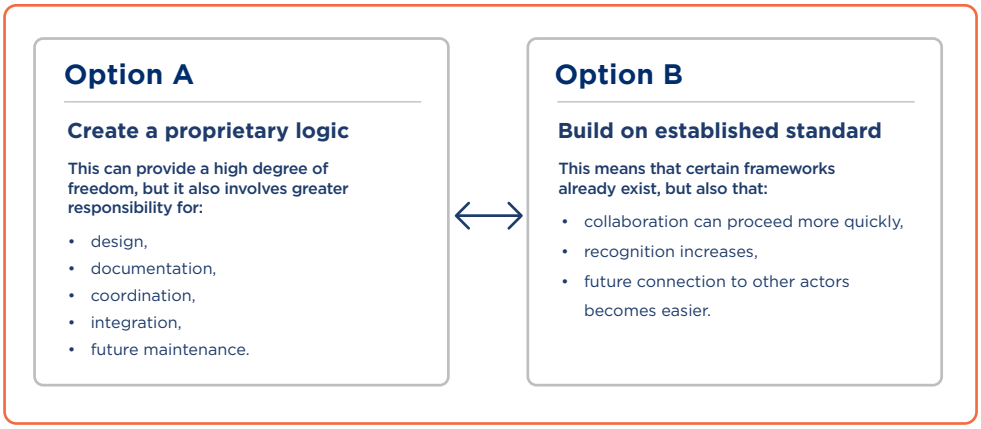
This makes GS1 relevant in a DPP context because it is established, designed for interoperability and capable of being built upon. GS1 standards have been used for a long time and at large scale, which means that much of the infrastructure already exists.

GS1 standards cover identification, automatic data capture, master data and event data within a coherent architecture. This makes them particularly relevant in environments where multiple actors need to understand and use the same information.

For many organisations, this means that a DPP does not require a complete restart but can instead be developed from something that is already in use. This is also important from an economic perspective, as it is often less expensive, faster and less risky to build on an established structure than to create an entirely new identity logic.

1.8 An initial choice for the economic operator

In practice, many companies face an early choice.



It is not always obvious which option is right. However, it is important to understand that the choice is not only technical. It affects cost, controllability and long-term flexibility.

1.9 An example: what a “sound foundation” means in practice

The difference between a weak and a strong identity foundation often only becomes clear when the organisation attempts to share information with others.

Imagine two organisations.

The first has internal item numbers that work very well in its own enterprise resource planning system. However, when an external partner needs to use the same information, a dedicated translation table is required. When the system is replaced, several connections must be rebuilt.

The second organisation already uses an identification logic that is recognised in the value chain. It still needs to develop its data, linking and traceability, but the product identity itself is already understandable and unambiguous in a broader context.

The difference between these two organisations is not about the amount of data. It is about structural maturity. This is the difference that DPPs make visible.

1.11 Brief summary

The most important points from this chapter can be summarised in five statements:

- DPPs begin with ensuring that the right information can be connected to the right product.
- Internal identifiers are often necessary, but they are not always sufficient.
- A product identity used in a DPP needs to be clear, stable and usable by multiple actors.
- Standardisation reduces the cost of collaboration and information exchange.
- GS1 standards are relevant to many actors because they are already established and can be built upon.

1.12 Reflection questions

Take a few minutes to consider the following before continuing:

- How do we identify products today?
- How many different identities does the same product have in our systems and flows?
- Which identifiers only work internally?
- Do we already have GS1 structures that can provide a foundation for further work?
- If we were to share our product information with a new actor tomorrow, what would be the first source of friction?



Chapter 2

Identification in Practice – A Usable and Persistent Identity

Chapter Overview

The first chapter explained why product identity is the first building block of a DPP. This chapter takes the next step and addresses a more practical question: how a product should actually be identified when the identity needs to function beyond the organisation itself and support a broader digital structure.

It is not enough to state that a product "has a number or a code". What matters is what is being identified, the level at which identification takes place, how long the identity needs to remain valid and which actors need to be able to use it. It is at the intersection of these questions that identification moves from an internal routine to a strategic structure.

2.1 All products need an identity – but not always at the same level

When discussing product identification, it is easy to assume that there is one correct way of doing it. In practice, this is not the case. A product can be identified at several different levels, and the appropriate level depends on what the organisation needs to be able to do with the information.

At its most basic, a product can be identified at model level. In this case, the product type is identified, and all instances of the same model share the same identity. At batch level, a group of related products is identified, for example products from the same production run or series. At item level, each individual physical product receives its own identity.

This is one of the most important choices in DPP implementation, because the level of identification affects cost, precision and future use. An identity that is too broad may make the information insufficient during certain parts of the lifecycle. An identity that is too detailed may create more complexity than the organisation actually needs to manage.

2.2 A simple way to understand the difference

The distinction between the levels becomes clearer when they are viewed as answers to different questions:

- **Model level** answers the question: Which item or product variant is this?
- **Batch level** answers the question: Which group or production run does the product belong to?
- **Item level** answers the question: Which exact physical item is this?

All three levels may be correct, depending on the context. If the purpose is primarily to provide general product information, model level may often be sufficient. If the purpose is better control over production, quality or recalls, batch level may be important. If, on the other hand, the organisation wants to be able to follow individual products through service, repair, reuse or recycling, individual level often becomes more relevant.

The important thing is therefore not to choose the most advanced level, but the level that best corresponds to the actual use case.

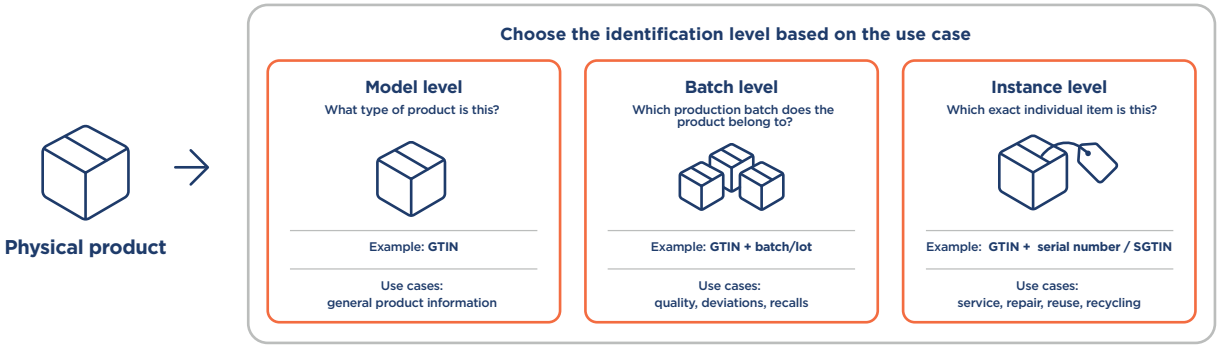


Figure 7. Choose the right identification level so that the selected use cases are enabled.

2.3 Why DPP makes this question more important

In more traditional information environments, it has sometimes been sufficient to identify the product to the extent required by the organisation's own operations. A model identity could be fully sufficient for sales, catalogue management or basic logistics flows.

DPP changes the conditions. When product data is to be used in several parts of the lifecycle and by several actors at the same time, the question of the level of detail becomes significantly more important. The organisation then needs to begin asking more precise questions. Do we need to be able to distinguish individual products from one another? Does certain information need to be linked to a specific object and not only to a model? Do we need to follow what has happened to a particular unit over time?

This is where granularity, meaning the level of detail in the identification, becomes central. A solution that is sufficient for sales does not necessarily need to be sufficient for repair, take-back, recycling or regulatory monitoring. DPP therefore makes the identity level a clearer and more strategic question than it has often been previously.

2.4 An important choice: how detailed does the identity need to be?

There is a natural temptation to assume that more detailed identification is always better. However, it is not that simple. A higher level of detail may provide greater precision, more advanced traceability and more opportunities for services and circular flows. At the same time, it means more identities to manage, more data, greater marking requirements and more changes to processes.

The choice therefore needs to be made carefully. An organisation needs to ask: What do we actually need to know about the product? Which regulatory requirements apply or can be expected? At which stage of the lifecycle would more detailed identification create the greatest value? Is the organisation ready to manage the additional complexity?

A sensible approach is often not to begin with the maximum level of detail, but with the level that creates clear value. This makes the identification not only theoretically correct, but also reasonable to implement and manage in practice.

2.5 What often happens within organisations

Many companies already have several identification levels in circulation, without this being entirely clear. One and the same product may have a product number in the business system, an item number in the commercial flow, a batch number in production, a serial number in service or warranty and an internal object number in a particular system.

Each of these identities may have a reasonable purpose. The problem arises when they are not connected. The identity landscape then becomes difficult to understand. The same product may be known in several different ways, and it becomes unclear which identity should be used in which context.

DPP makes this very clear. When information is to follow the product across more processes and more actors, it quickly becomes apparent whether the organisation has a coherent identity logic or whether it has developed gradually, without a clear structure. What could previously be managed through internal habit or local translations then becomes a clear weakness.

2.7 GS1 as a practical solution for identification

It is in this situation that GS1 often becomes practically relevant. GS1 offers not only a general idea of identification, but specific identifiers for different types of objects in the value chain. GTIN is used, for example, for products. GLN is used for legal entities, functions and locations. GTIN + serial number is used for serialised identification of individual products.

This makes GS1 particularly useful when an organisation wants to build a DPP structure that not only works internally, but also together with others. The identities are established, recognisable and developed for use in open value chains, that is, where all actors are not known to the party placing the products on the market. For many economic operators, this means that identification does not need to be invented from the beginning, but can build on what is already used in trade, logistics and data sharing.

This does not mean that GS1 automatically resolves all questions concerning identity. But it does mean that the organisation gains access to a structure that has already been tested on a large scale and that often fits well with DPP's needs for clarity, shareability and long-term viability.

2.7 Product, location and actor – more than just the product needs to be identified

When first beginning to work with DPP, it is common to think that identification only concerns the product itself. But in practice, this is rarely sufficient. For the information surrounding a product to become meaningful, it is often also necessary to identify other objects in the value chain.

This may, for example, involve knowing who manufactured or was responsible for the product, where a particular event took place or which facility, location or function was involved. It is therefore important to understand that identity in relation to DPP does not only concern the product. It also concerns the actors and locations that make it possible to place the product information in its context.

Here, GLN often becomes an important complement to the product identity, because it provides a shared way of identifying parties and locations in a larger information flow. This strengthens not only traceability, but also the interpretability of the data that is shared.

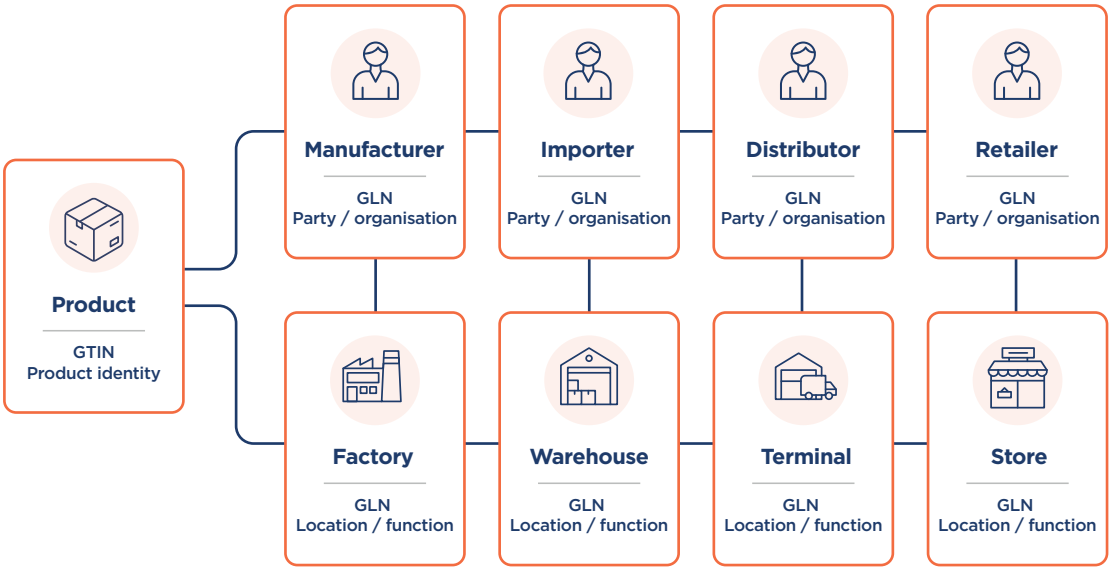


Figure 8. Identification of products, actors and locations makes data easier to interpret.

2.8 When individual level becomes particularly important

It is worth pausing at the individual level, because it often becomes central in discussions about DPP. When each individual product receives a unique identity, the possibility arises to link information to the exact object that is actually used, serviced, resold or recycled.

This can be particularly valuable when the organisation wants to follow repairs, document maintenance, distinguish one product from other identical instances, create more reliable take-back or recycling or combat counterfeiting. Individual level therefore makes it possible to move from general product information to more precise and object-specific lifecycle management.

At the same time, individual level is not always the natural first step. It usually requires more in terms of marking, data management and processes. It is therefore sensible to treat serialisation as a business choice and not merely as a technical possibility. The fact that it is possible to identify every instance does not automatically mean that it is right to do so in every context.

2.9 A way of thinking: begin with the use case

When organisations become uncertain about which identification level they need, it often helps to begin with the use rather than the technology. If the

objective is primarily to provide general product information, model level may often be sufficient. If the objective is to manage production deviations and recalls more effectively, batch level becomes more important. If the objective is to follow individual products through repair, reuse or recycling, individual level often needs to be considered.

This way of reasoning makes the decisions easier to understand. It also reduces the risk that the organisation introduces an overly granular level of detail too early or, conversely, underestimates future needs. By beginning with the use case, identification becomes a response to a business question.

2.10 Building on what is already in place

An important insight is that many companies already have parts of this in place. This may include GTIN in trade and sales, batch numbers in production, serial numbers in the aftermarket or service and GLN in certain data-exchange flows.

DPP does not require such structures to be replaced. It is often instead a matter of creating better order between existing identities and using them more consistently. This is why DPP is often described as a further development of an existing structure, not as a complete restart. This is important both practically and economically.

2.11 Some economic choices that arise already at this stage

It quickly becomes clear that identification is not only a technical question, but also an economic one. The company needs to balance simplicity against precision, short-term cost against long-term benefit, internal freedom against external usability and existing structure against new design.

A less precise level of detail is often easier to introduce, while a higher level of detail can provide more exact information and more future opportunities. A simpler solution may be cheaper now but more difficult to develop later. A proprietary logic may feel efficient internally but create additional work in collaboration with others. Building on established standards can reduce risk and make implementation faster.

There is no universally correct answer. But it is important to understand that these trade-offs should be made consciously, not out of habit. What initially appears to be a technical choice often proves to be a choice for the entire future DPP structure.

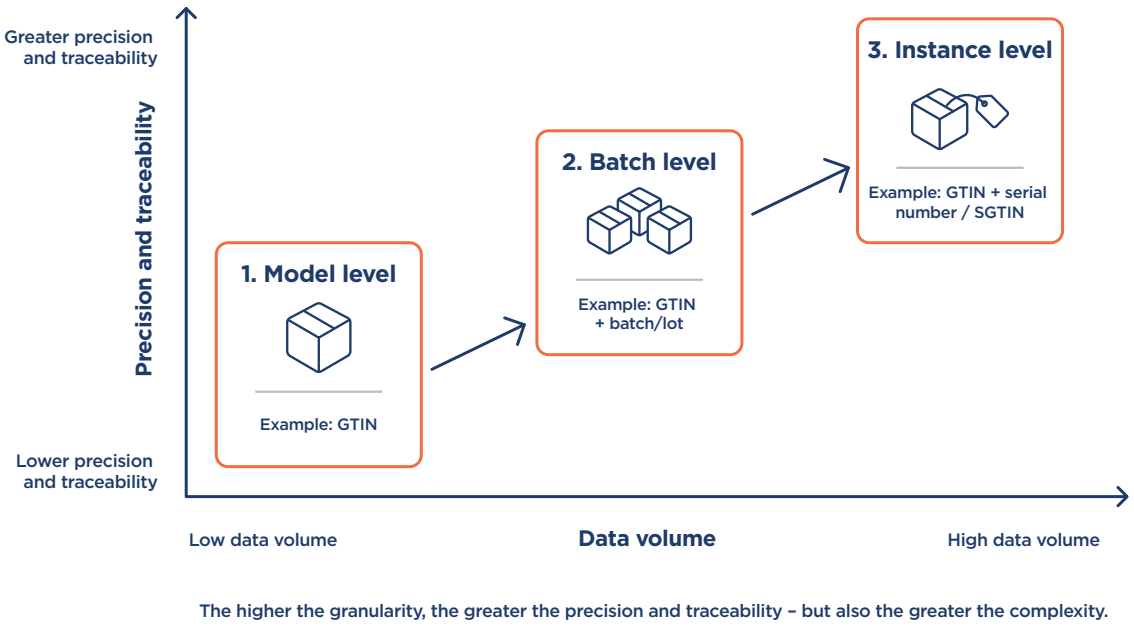


Figure 9. Precision, traceability and complexity for different identification levels.

2.12 Brief summary

The most important points from the chapter can be summarised as follows:

- Product identification can take place at model, batch or individual level.
- DPP makes the choice of level more important than previously.
- A higher level of detail provides more opportunities, but also higher requirements.
- Organisations often already have several identities in circulation, but not always a clear structure between them.
- GS1 provides practical and established identity keys for products, locations and actors.
- For many companies, the work is more about building further than starting again.

2.13 Reflection questions

Consider the following before continuing:

- At what level do we identify our products today?
- Where would more detailed identification create real value?
- Where would it instead create more work than benefit?
- Which identities do we already use for products, locations and actors?
- Do we have a coherent identity logic, or several parallel ones?



Chapter 3

Data carriers – how identification is used in reality

Chapter Overview

The previous chapter dealt with which identity a product needs in order to function in a DPP context. In this chapter, the focus shifts to the next practical question: how that identity is actually made usable on the product itself. An identifier that only exists in a system is not sufficient for DPP. If no one can read it from the product, the packaging or accompanying documentation, it becomes difficult to use in real flows. The data carrier therefore becomes the point where the product's digital identity meets physical reality. It is also here that marking takes on a different meaning than in traditional product information. In a simpler logic, a code may be sufficient if it works for a single purpose, for example scanning in a store or internal warehouse management. In DPP, the same product often needs to be usable in more contexts and by more actors. The data carrier thus becomes not only a technical format, but a practical tool that determines whether the product identity can actually be used.

3.1 From identity in a system to identity on a product

A product can be well defined in a business system and still be difficult to manage in reality. The reason is simple: the digital identity must be able to meet the physical product. This is where the data carrier comes in.

A data carrier is the medium that allows an identifier to exist on or near the product, be read by people or machines and be used in a process. It may be a barcode, a 2D code, an RFID tag or, in certain cases, information in an accompanying document or other material. What matters is not only that the data carrier exists, but that it works in the context in which the product is actually used.

The data carrier should therefore be understood as a bridge. On one side is the product's identity and the digital information associated with it. On the other side is the physical product and the situations in which someone needs to read or use the information. The data carrier connects these two worlds. In DPP, it therefore becomes more than "a code on the packaging". It becomes a central part of how product information reaches the right user at the right time.

The data carrier therefore becomes the point where the product's digital identity meets physical reality.

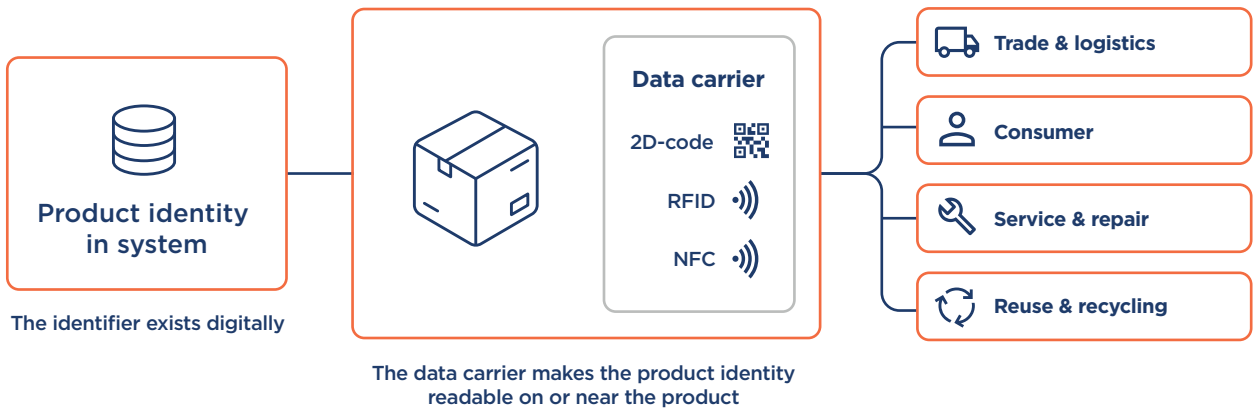


Figure 10. Data carriers make the product's identity readable on or near the product.

3.2 Why DPP places higher requirements on the data carrier

Data carriers are already used today in many operations. The most familiar example is the barcode in retail. But DPP changes the conditions for how the data carrier needs to function.

Previously, a code could be sufficient if it supported one clearly defined use case, for example point-of-sale scanning, internal warehouse management or identification upon delivery. With DPP, the use becomes broader. The same product may need to be encountered by the manufacturer, logistics, the retailer, the consumer, the repairer and the recycler. This means that the data carrier must be capable of more than before. It must not only be readable. It must also be understandable in the correct context, durable over time and possible to use in several different parts of the product's lifecycle.

It is this expanded use that makes the data-carrier question more strategic than it has often previously been.

3.3 The data carrier is not the same as the identifier

An important distinction needs to be made clear early: the data carrier is not the same as the identifier.

The identifier is the logical identity. The data carrier is the way in which the identity is carried, displayed or communicated. This means that the same identifier can, in principle, be represented in several different ways. A product identity may, for example, occur as a linear barcode, a 2D code, an RFID tag or a digital document.

This distinction is important because it provides flexibility. An organisation may want to retain the same product identity but change the data carrier when new regulatory requirements are introduced, new use cases arise, technology changes or the product lifecycle requires different support. The data carrier therefore does not become a permanent characteristic of the identity, but a practical expression of how the identity is used in a particular environment.

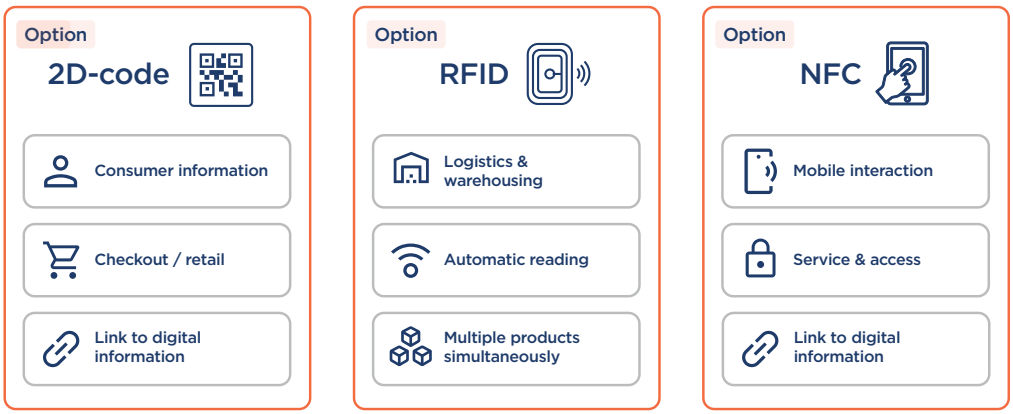


Figure 11. Choice of data carrier – 2D code, RFID or NFC.

3.4 The traditional barcode and why it is not always sufficient

The linear barcode, meaning the 1D code, has been highly successful. It has made trade, logistics and scanning efficient on a large scale and still constitutes a central part of many flows. But in a DPP context, it is not sufficient.

This is not because it is wrong, but because the use has become broader. A 1D code is often well suited to simple product identification, rapid scanning and standardised trade flows. However, it is less suitable when the organisation needs to carry more complex information, support several use cases simultaneously, connect to richer digital information or create a solution that is more future proof.

This is why the transition to 2D codes has become so important in the discussion about DPP.

3.5 Why 2D codes have become central

2D codes provide greater information capacity and greater flexibility than traditional 1D codes. In practice, this means that they can better support a reality in which the product is not only to be identified in trade, but also to function as an entry point to a digital information environment.

Examples of such data carriers are Data Matrix and QR codes. What makes them relevant in DPP is not only that they can contain more information, but that they can be used as a shared entry point to information that exists in several systems and is used by several actors.

QR codes in particular are important from a consumer perspective, because today they can be read by most modern mobile phones using standard functions in the camera or operating system, without the installation of special DPP software. This makes it possible to give consumers direct access to relevant product information, while the same data carrier can support professional use cases in trade, logistics, service or recycling.

For an economic operator, this means that marking is no longer only a labelling question. It becomes part of the product's digital infrastructure and a practical access point between the physical product, digital information and different target groups.

3.6 One data carrier – several areas of use

One of the most important changes in the DPP logic is that the same data carrier often needs to support several uses. Previously, it has been common for different functions to use different codes: one for sales, another for logistics, a third for internal marking and sometimes a fourth for consumer information. This easily leads to complexity, duplication of work and lack of clarity.

In DPP, the ambition is often the opposite: that a single same data carrier should be able to support several use cases. This does not mean that all information must be contained in the data carrier itself. But it does mean that the same data carrier can function as an entry point to several different information flows. This reduces the number of parallel solutions and creates better conditions for simple use, lower marking costs and better interoperability.

For many organisations, this is a shift in perspective. The data carrier moves from being function-specific to becoming part of a broader and more coherent information structure.

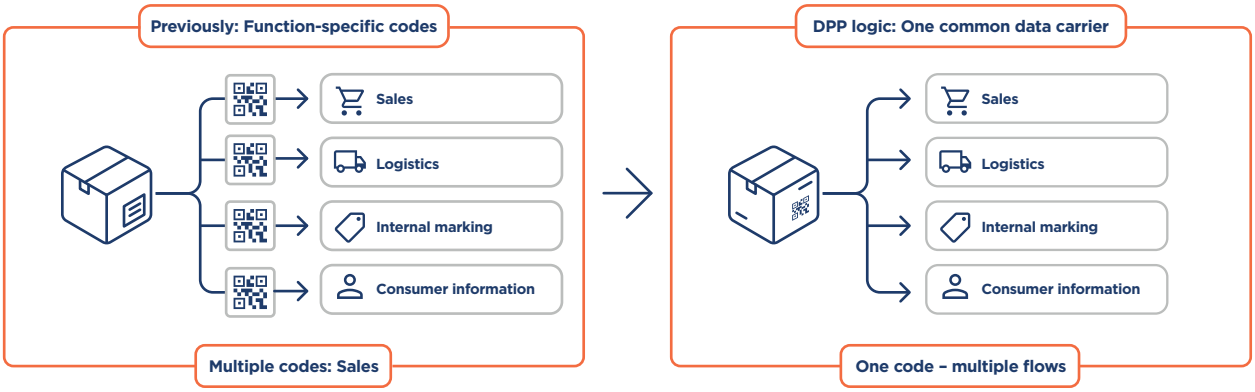


Figure 12. One data carrier can have several different functions.

3.7 The data carrier must function in real environments

It is easy to think of data carriers as something technical and neutral. But in reality, they are highly dependent on the environment in which they are used. A data carrier that works well in a store does not necessarily work equally well in a damp environment, on small products, after prolonged use, in the recycling stage or on products that are repaired or remarked.

This means that the choice of data carrier is also a choice concerning placement, durability, reading distance, exposure and target group. A data carrier should therefore never be selected solely on the basis of theoretical function. It must be selected on the basis of its actual context of use. It is only when it is known where, how and by whom the code will be used that the choice of data carrier becomes meaningful.

3.8 Which choices an economic operator needs to make

In practice, the choice of data carrier becomes a balance between several different factors. The organisation needs, among other things, to decide whether simplicity is more important than greater information capacity, whether the data carrier should be visible to everyone or embedded in the product, whether the focus is on one use case or several, whether low initial cost or greater future-proofing should be prioritised, and whether it is sufficient to carry the identity on the packaging or whether it must be present on the product itself.

These choices cannot be made in the abstract. They must be related to real use cases. Only then is it possible to determine which type of data carrier is reasonable, durable and economically justifiable.

3.9 GS1's role in data carriers

GS1 becomes relevant in this chapter because GS1 defines not only identities, but also how they are placed and used in practice. For many organisations, this means that established marking principles, experience of scanning, product flows in which GS1-based data carriers are used and operational rules for how data is to be represented in codes already exist.

This means that DPP can, in many cases, build on existing use of GS1 standards instead of creating entirely new marking logics. This is particularly important economically. If the company already has processes for labelling, scanner infrastructure, product marking in trade or logistics and knowledge of GS1's code structures, there is often a clear head start that can be used in DPP work.

3.10 DPP makes the data carrier more strategic

In traditional product marking, the data carrier has often been an operational aid. In DPP, it becomes something more. It becomes an entry point to the product's digital identity, support for several users, a tool for data sharing and part of the product's long-term information structure.

This means that the data carrier is no longer only a concern for the labelling team or the logistics function. It concerns the business model, product development, information architecture, user experience and sustainability work. It is therefore important to view the data carrier as part of the overall DPP design, not as a late addition at the end of a project.

3.11 A simple way of thinking

If identification answers the question what the product is, then the data carrier answers the question how do we encounter the product in reality. This is a useful way of thinking. First, the product needs an identity. Then that identity needs to be accessible where the product actually exists. That is the role of the data carrier.



3.12 Brief summary

The most important points from the chapter can be summarised as follows:

- An identifier in a system is not sufficient. It must be made usable on or near the product.
- The data carrier is the medium that makes the identity readable in practice.
- DPP places higher requirements on data carriers than traditional single-function solutions.
- 2D codes are often central because they better support several uses over time.
- The choice of data carrier affects cost, durability, readability and future flexibility.
- For many companies, GS1-based marking already exists to build on.

3.13 Reflection questions

Consider the following before continuing:

- How are our product identities carried today?
- Are our data carriers designed for one use case or several?
- In which environments do our data carriers need to function?
- Can we build on existing marking, or do we need to change it?
- Where is the greatest risk: in the technology, in the process or in the choice of use case?

Chapter 4

Linking – how the product identity leads onwards to the right information

Chapter Overview

The previous chapter dealt with how the product identity is carried in practice, for example in a 2D code. But a data carrier in itself is not the final objective. The real question is what happens after the code has been scanned. How does one move from identity to information? How does the product become an actual entry point to its digital context?

This is where linking becomes decisive. DPP is not only about a product being identifiable, but also about the identity being able to lead onwards to relevant information in a way that works over time, for different users and in several different contexts. Linking is therefore the step where DPP becomes more than marking. It makes the product identity practically usable as a guide to data, services and documentation.

4.1 From identity to access

A product can be correctly identified. It can also be marked with a functioning data carrier. But if no one can proceed to the right information, DPP has still not begun to function fully.

Linking is fundamentally the mechanism that enables an identifier to be used to find information. It is the step where the product becomes an actual entry point to its digital context. It sounds simple, but it is precisely here that several of the more decisive questions arise. Where is the information? Who should be able to access it? How is it ensured that the link still works if the systems change? And how does one avoid building something that works today but not in two years?

Linking should therefore not be understood as a technical detail at the end of the chain. It is part of the logic itself of how a physical product is connected to its digital presence.

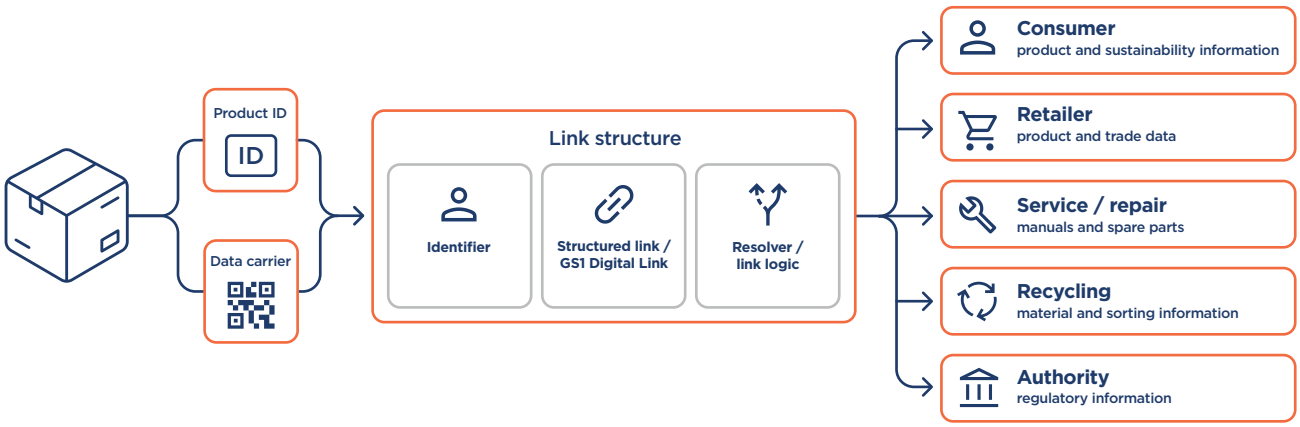


Figure 13. Link and identity connect the product with digital information.

4.2 Why an ordinary link is not always sufficient

It is easy to think that linking only means placing a web address in a QR code. In certain simpler cases, this may work. But in a DPP context, that solution often becomes limited.

An ordinary web address is often connected to a specific website, built for a single use case, difficult to manage when structures change and dependent on the underlying environment remaining stable. It works as long as everything remains the same. But DPP is intended to function throughout the product's lifecycle, and that means that much can change. Companies can change systems, information can be moved, new users can be added, and other types of data may need to be exposed. If the link is then too tightly connected to today's web structure, the solution becomes fragile.

A sustainable linking model therefore needs to be more robust than a simple direct link. The product should not only point to a page. It should be able to function as a persistent route to information even when the digital environment around it changes.

4.3 What good linking needs to be capable of

For linking to function in a DPP context, it needs, in practice, to be capable of four things simultaneously.

It needs to be clear, so that it is evident which product the link refers to. It needs to be stable, so that the solution still works even if the content behind it changes. It needs to be flexible, because the same product may need to lead to several different types of information. And it needs to be usable by several actors, because consumers, companies, authorities and others often have different needs.

This shows why linking is not only about finding a web page. It is about creating a persistent and meaningful route from product to information. A good linking model makes it possible to allow the identity to remain even when presentation interfaces, information layers and internal systems change.

4.4 A product identifier may need to lead to several different things

An important insight in DPP is that the same product ID does not necessarily need to lead all users to exactly the same information. On the contrary, different actors often need different parts of the product's digital reality.

A consumer may want to see user information or sustainability information. A retailer may need to confirm the product identity and trade information.

A repairer may want to access spare-parts or service information. A recycler may need material information.

One or more authorities may want to check different regulatory data.

This means that a product identity should not be linked to only one single page in a narrow sense. Instead, it needs to be able to function as an entry point to several types of information, depending on the context. This is where linking moves from being "a link" to becoming a structure for access.

4.5 Linking as part of the architecture

It can be tempting to treat linking as something that is resolved late in the process, when identity and data carriers are already in place. But in practice, linking should be viewed as part of the entire information architecture.

How the link is designed affects how easily information can be managed, how easily new use cases can be added, how dependent the solution becomes on particular systems and how well the company can collaborate with others. A weak linking strategy often means that every new need requires a new solution. A strong linking strategy means that the same foundation can continue to be used.

This is also an economic question. If linking is designed wisely from the beginning, the need for rebuilding later is reduced. What may initially appear to be a small design question therefore becomes a choice of great importance for future management and development.

4.6 GS1 Digital Link – why it often becomes relevant here

This is where GS1 Digital Link often becomes relevant. GS1 Digital Link has been developed to make it possible to express GS1 identities in web-address format in a consistent manner. The idea is not only to make an identity look like a URL, but to create a shared structure in which GS1 identifiers can be used in web addresses to link to information and services, and at the same time be used offline, for example in in-store scanning.

This is an important distinction. GS1 Digital Link is therefore not only "a link". It is a way of making the product identity directly usable in a web-based information environment, without losing the connection to the underlying standardised identity. For many organisations, this becomes attractive because it builds on identities they already use, supports several use cases and creates better long-term order between the physical product, the code and digital information.

In this way, GS1 Digital Link connects two worlds that are otherwise easily separated: the standardised identity and practical access to information.



Figure 14. GS1 Digital Link structures web links with GS1 identities.

4.7 What this means in practice

When an organisation uses a linking model based on a shared structure, several things happen at the same time. First, it becomes clearer that the product is the point of departure, not the individual website. Second, it becomes easier to change the content behind the link without the product needing to be remarked. Third, it becomes easier to allow the same product to lead to different types of information without creating several parallel identities.

This is particularly important in DPP, where the product's digital context can change over time. A product that is initially used for sales and basic information may later need to support service, spare parts, take-back, reuse or regulatory compliance. If the linking is too narrow from the beginning, such steps become difficult to take.

A well-considered linking strategy therefore often becomes a prerequisite for DPP to be able to develop gradually without the foundation needing to be remade.

A well-considered linking strategy therefore often becomes a prerequisite for DPP to be able to develop gradually without the foundation needing to be remade.

4.8 Which choices an economic operator needs to make

When linking becomes part of DPP, several specific choices arise. A company needs, for example, to decide whether the code should point directly to a page, or whether the linking should be based on a more robust and standardised model. It also needs to determine whether the solution is intended for a single use case, or whether several actors should be able to use the same entry point.

The question of short-term simplicity versus long-term management also arises. A simple URL may be quick to introduce, but difficult to manage over time. The organisation also needs to determine whether the product identity and the linking should exist within the same structure or be kept separate, and whether it should design its own linking logic or build on a model that is already used internationally.

These choices affect technology, cost, ability to collaborate and future flexibility. Linking thus becomes a question where architecture, user logic and economics meet.

4.9 Linking and openness

One aspect that is often overlooked is that linking also affects how openly DPP functions in practice. If the information can only be accessed through special apps, login, specially adapted tools or solutions that only work in certain environments, then DPP becomes less usable.

This does not mean that all information must be open to everyone. But it does mean that the part that is to be available should be accessible in as frictionless a way as possible. Linking therefore becomes a question of user experience and accessibility. The more obstacles that are built into access, the weaker the product's role becomes as an entry point to its digital context.

4.10 When linking becomes a competitive issue

It may be tempting to view linking as purely an infrastructure question. But in certain industries, it quickly becomes strategic. An organisation that has a well-considered linking model often finds it easier to add new information layers, support new services, work with several target groups, manage data over time and scale to more products and markets.

An organisation with weak linking, on the other hand, more often has to start again every time a new need arises. The difference is not always noticeable immediately, but it becomes clear over time. What initially appeared to be a choice of URL structure may later prove to be a choice between future flexibility and future rebuilding.

4.11 A simple way of thinking

If Chapter 2 answered the question who is the product, and Chapter 3 answered the question how do we encounter the product in reality, Chapter 4 answers the question: how does the product identifier lead us onwards to the right information? That is the role of linking.

4.12 Brief summary

The most important points from the chapter can be summarised as follows:

- DPP requires that products can not only be identified, but also lead to the right information.
- Linking needs to be clear, stable, flexible and usable by several actors.
- An ordinary direct link is often too fragile as a long-term DPP solution.
- The same product may need to provide access to different information depending on the user and context.
- GS1 Digital Link is relevant because it provides a structured way of combining identity and digital access while also enabling offline scanning of products.

4.13 Reflection questions

Consider the following before continuing:

- How is product information accessed in our organisation today?
- What happens to our links if we change systems or move content?
- Does the same product need to be able to provide access to different information for different users?
- Is our current linking built for one use case or for several?
- Can we build on identities we already use, or do we need to create new logic?

Chapter 5

Data – how information becomes understandable, usable and possible to share

Chapter Overview

The previous chapters have addressed three crucial steps in the DPP logic. The product is given an identity, the identity is carried in a data carrier, and the data carrier leads to information. This raises the next question: how does the information need to be designed in order to actually function in DPP?

It is not enough for data to exist. It must also be clear, consistent, possible to understand, possible to share and possible to use in different systems and contexts. This is why this chapter concerns the information structure behind DPP. The question is not only what information exists, but how it is expressed, organised and made usable outside its original context.

5.1 Data is not just information – it is also format

When organisations talk about product data, they often think first about the content. This may concern materials, weight, origin, repair information, sustainability information or technical characteristics. But in DPP, it is not only the content that matters. How the information is expressed also matters greatly.

Two companies may, in principle, say the same thing about a product but do so in such different ways that the systems do not understand that the meaning is the same. One company may write “recycled plastic”, another “plastic, recycled content”, and a third may use an internal code value. All three may mean approximately the same thing. But for a system, or for another actor in the value chain, this is not necessarily understood as the same information.

This is why DPP requires more than just data. It requires structured and defined data. Without structure and definitions, the content becomes difficult to compare, difficult to reuse and difficult to trust when it moves between different environments.

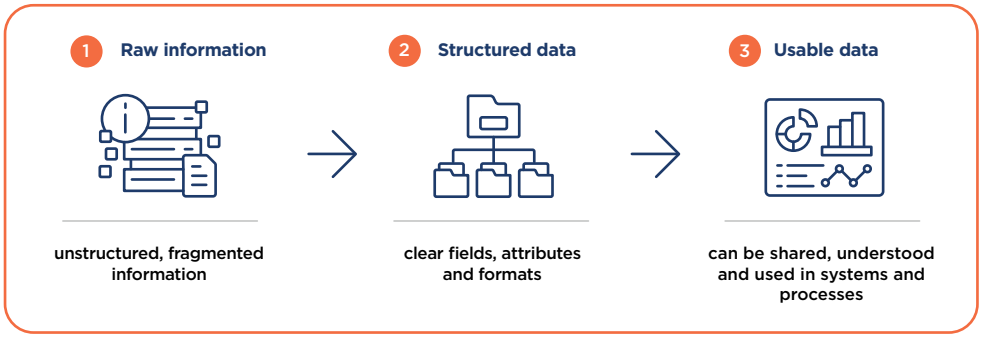


Figure 15. From raw information to usable data.

5.2 Why free text often becomes a problem

Free text has an important place in many operations. It is flexible, quick to write and often well suited when people are to read and interpret the content directly. But free text quickly becomes a problem when information needs to be compared between products, used in several systems, analysed automatically, shared between different actors or used as a basis for regulatory monitoring.

This does not mean that free text is always wrong. But in DPP, it is rarely sufficient as the basic structure. Put simply: free text is good for describing, while structured data is good for sharing, comparing and using. DPP often needs both, but it is the structured data that carries the largest part of the digital logic.

The more an information flow depends on human interpretation, the more difficult it becomes to create stability, interoperability and long-term usability.

5.3 What it means for data to be structured

When data is structured, it means that it is organised according to clear rules. Each data point has a name, the meaning is clear, the value is expressed in an expected way, and the same type of information is handled in the same way over time.

This makes a major difference. If two actors both use a clearly defined field for net weight, it becomes easier to compare information, check whether it is reasonable and reuse data in more contexts. Structure therefore reduces the need for interpretation. And the less interpretation that is required, the better DPP functions.

This is also why information structure should not be understood as a technical detail. It is a prerequisite for data to be able to move between systems while retaining its meaning.

5.4 Semantics – a difficult word for something very practical

Semantics may sound theoretical, but in practice it concerns a simple question: does the information mean the same thing to everyone who uses it?

This is one of the most important questions in the whole of DPP. Consider the word “weight”. What does it mean? Net weight? Gross weight? Weight including packaging? Weight per unit? Weight per batch? If it is not clear what is meant, the information becomes uncertain even if the figure itself is correct.

The same problem arises with many other types of information: material, content, country of origin, repairability or energy characteristics. Semantics is therefore not an additional layer on top of the data. It is the prerequisite for the data to be used correctly.

DPP therefore not only requires data to exist, but also that it can be interpreted in the same way in different contexts. Only then does the information become truly shareable.

5.5 DPP content: what should actually be included?

Here, it is important to distinguish between two things that are often confused. The first question concerns how data is structured. This concerns the model, format, fields and meanings. The second question concerns which data must actually exist. This concerns which information is required for a particular product group.

The latter is not determined generally, once and for all, in the DPP standards. In practice, much of the specific content of DPP will be defined in delegated acts or other regulations for different product groups. This means that different types of products may be subject to different requirements regarding which information must be included.

This is an important principle. DPP is therefore not one fixed list containing the same data for all products. Instead, there is a common structure surrounding DPP, while the more detailed content is largely specified product group by product group.

For an economic operator, this means that two questions must be kept separate. How do we build an information structure that works in the long term? And which data elements must we provide for our particular products? The first question concerns architecture and order. The second concerns product-group-specific requirements.

5.6 The role of GS1 – structuring, not determining the content

GS1 has an important role here. GS1 standards can be used to structure data so that it becomes easier to understand, share, compare, process and use in different systems. This may concern shared identities, clear terms, established information models and standardized logic for how data is expressed.

But it is important to be clear about one thing: GS1 standards do not themselves define which DPP information must exist for each product group. This is largely done through delegated acts or other regulations. GS1 can therefore help create order and

interoperability in how data is expressed, but cannot alone determine exactly what content should be required for all products.

This is an important distinction. In general, it can be said that delegated acts determine what should be included, while GS1 can help structure how it is expressed. This is precisely why GS1 often becomes practically relevant without replacing regulatory decisions.

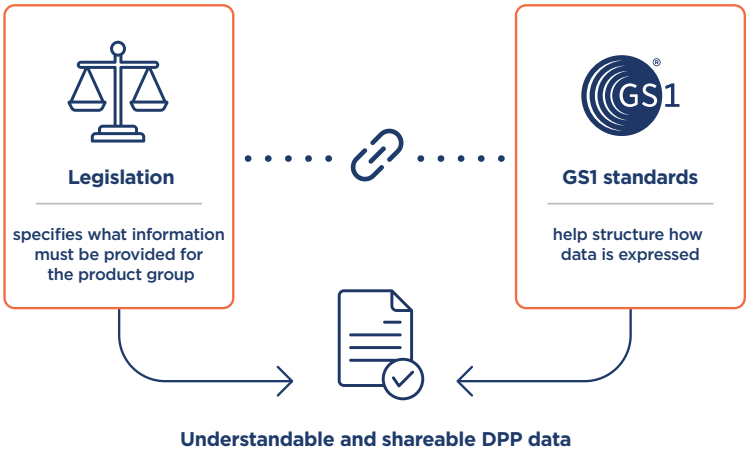


Figure 16. Legislation describes what is to be shared. GS1 standards describe how data is structured.

5.7 When structure becomes more important than the amount of data

Many organisations already have a great deal of information. The challenge is often not to produce more data, but to create better order in the data that already exists.

It is easy to believe that DPP primarily requires more content. But in many cases, the real challenge is instead that the same thing is expressed differently in different systems, that definitions differ between functions, that data exists but cannot be reused, and that the connection between the product and the data is weak.

This is why the question of structure is so central. A smaller amount of well-structured data is often more valuable than a large amount of data that is difficult to interpret or share. DPP makes this very clear, because the value does not lie in the amount of information itself, but in the ability to use the information consistently over time.

5.8 Choices an economic operator needs to make

When the organisation begins working with DPP data, several practical and strategic choices arise. One of them concerns the balance between free text and a structured model. How much of the information should be contained in descriptive text, and how much needs to be expressed as clear data points?

Another choice concerns language and concepts. Should the organisation continue using its own terminology, or adapt to shared definitions that

make the information more shareable? A third choice concerns the time horizon. Should it only provide what is required now, or create a model that also works for future needs?

The organisation also needs to decide whether the data should be organised according to internal system boundaries or according to how it needs to function in a larger ecosystem. Finally, the question arises of how much should be adapted for each product group and how much should be common across the entire organisation.

This demonstrates that data modelling in DPP is not a matter of detail. It is a central part of business design. How data is structured affects how effectively the company can collaborate, automate and develop its information flows over time.

5.9 A practical way of thinking

It can be helpful to think of DPP data in three layers. The first layer is identity: which product does it concern? The second layer is structure: how is the information organised so that it can be understood and shared? The third layer is content: which information is required or valuable for this particular product?

If the second layer is missing, the third becomes much more difficult to use, even if the information itself exists. This is why this chapter comes before interoperability and traceability. Before data can be shared and followed, it must be understandable in its form.

This way of thinking also helps organisations distinguish between two problems that are otherwise easily confused: the problem that information is missing, and the problem that the information exists but cannot be used.

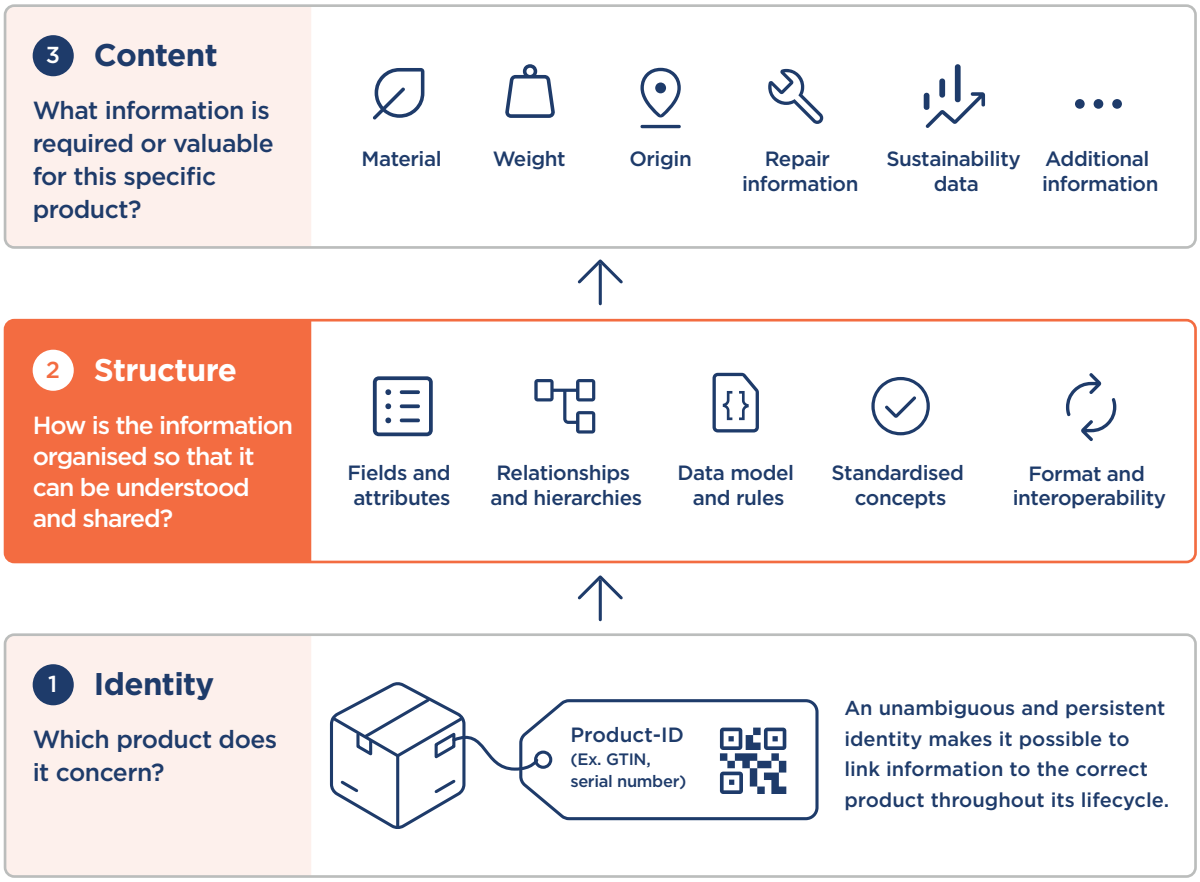


Figure 17. DPP data in three layers.

5.10 GS1 as a bridge between internal data and shareable data

For many companies, GS1 standards become relevant precisely because they can function as a bridge between internal product information and externally shareable information. This does not mean that all internal data must be replaced. But it may mean that the company needs to create a clearer translation between internal structures and a more standardized model that functions in DPP.

This work is often more valuable than attempting to create an entirely new information environment from the beginning. By building a bridge between what already exists and what needs to be shared, the organisation can both protect previous investments and create better conditions for interoperability.

5.11 Brief summary

The most important points from the chapter can be summarised as follows:

- DPP data must be understandable, shareable and usable in several contexts.
- Free text is often too weak as a foundation for DPP.
- Structured data reduces the need for interpretation and makes reuse easier.
- Delegated acts largely determine which information must exist for different product groups.
- GS1 standards can be used to structure and standardise how data is expressed.
- For many organisations, the most important step is not to create more data, but to create better order in the data that already exists.

5.12 Reflection questions

Consider the following before continuing:

- How much of our product information is currently free text?
- Where do we use different terms for the same thing?
- Do we make a clear distinction between information structure and information content?
- Is our data organised so that it can be adapted to future delegated acts?
- Where could GS1 standards help us create greater order and shareability?

Chapter 6

Interoperability – when information is usable between systems

Chapter Overview

In the previous chapter, we saw that the information behind DPP must be structured in order to become understandable and usable. But even if the data is clear, one crucial question remains: how can different systems and different actors use the information in a functioning way? This is where interoperability comes in.

Interoperability is a word that is often used but can easily become abstract. In the context of DPP, it needs to be understood very concretely. It is not only about information being sent from one system to another. It is about the information also being understood, placed in the correct context and used further without extensive manual interpretation.

6.1 What interoperability actually means

In practice, interoperability means that two or more systems can exchange information and use it in a meaningful way. It is therefore not enough for data to be technically transferable. The recipient must also be able to read it, understand it, place it in the correct context and use it further without first translating, interpreting or correcting it manually.

This is an important distinction, because many organisations already exchange information in some form and may therefore easily believe that interoperability already exists. But information exchange in itself is not sufficient. If the data arrives but cannot be used directly, the organisation still has a problem, even if the technology itself works.

Interoperability is therefore not only about connection, but about function. It is this distinction that makes the concept so central to DPP.

6.2 Why this is so important in DPP

DPP is not intended to function within a single organisation. Information about a product often needs to be usable by several actors: manufacturers, importers, distributors, retailers, repairers, recyclers, authorities and sometimes also consumers. This means that DPP always has an ecosystem perspective.

As soon as several actors are to use the same information, the need for interoperability arises. Without it, DPP in practice becomes just another internal system. The product may be given a digital description, but that description cannot move sufficiently well through the value chain to create real value.

DPP therefore makes interoperability a prerequisite, not an improvement that can be added afterwards.

6.3 Three levels of interoperability

It can be helpful to divide interoperability into three levels.

The first is technical interoperability. This means that the systems can technically exchange data, for example through APIs, file transfers, message flows or database connections. This is necessary, but not sufficient. The second is structural interoperability. This means that the data is organised in a way that both systems can read. Fields need to be known, formats clear and the data delivered in a form that can be processed. The third is semantic interoperability. This concerns the information meaning the same thing to all parties. Concepts need to be understood in the same way, values interpreted in the same way and the context made clear.

Only when all three levels function together does genuine interoperability arise. A company may therefore have technical integration without having structural or semantic interoperability and may consequently still lack the functionality that DPP actually requires.

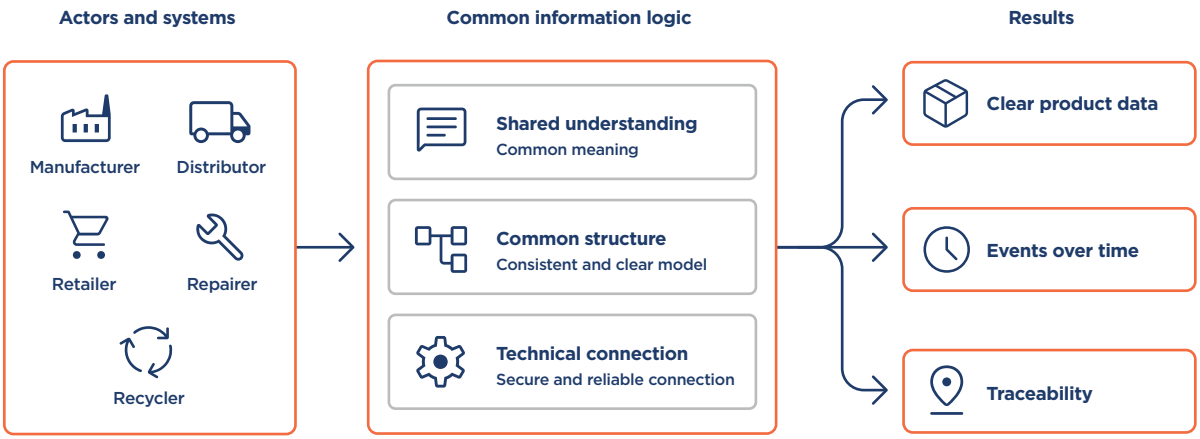


Figure 18. Interoperability is based on technology, organisation and semantics.

6.4 Why integration does not automatically mean interoperability

Many organisations already have numerous integrations between systems. They have APIs, data warehouses, file exchanges and automated flows. It can therefore be tempting to think that interoperability already exists.

But integration and interoperability are not the same thing.

A company can have many technical connections and still have low interoperability. This is because integration often resolves the question of how data is moved, but not necessarily the question of how data is understood. If the recipient still needs to interpret, translate or supplement the information manually, the connection may be technically functional, but it is still weak as a foundation for DPP.

It can be expressed in this way: integration concerns connection, while interoperability concerns shared functionality. This is a crucial distinction when product information is to be used in a larger ecosystem.

6.5 Why non-standard point-to-point solutions become a problem

In many value chains, information exchange has developed gradually. One actor has built a connection to another. Then another connection. Then more. Eventually, a network of point-to-point solutions emerges.

This can function reasonably well on a small scale but often leads to problems as more actors are added. Each new connection requires work. Each difference in the data model creates a need for translation. Each change in one system affects several others. The cost of management increases over time.

This is particularly problematic for DPP, because the number of stakeholders is often large and the use cases change over time. A structure that only functions through a web of specialised solutions quickly becomes expensive, difficult to understand and difficult to develop further.

This is why standardisation and shared structures become so important. They make it possible to reduce dependence on each individual connection and instead build for more general interoperability.

6.6 What is required for data to be genuinely shareable

For data to be genuinely usable between actors, several basic conditions need to be fulfilled.

The identity must be clear. Everyone needs to know which product, location or actor the data concerns. The data model must be understandable. It must be clear what information exists and what it means. The format must be manageable. The data needs to be transferable in a form that can be read and used. Responsibility must also be clear. It needs to be clear who publishes, updates and uses the information.

When these four conditions work together, the possibility of data actually being shared in practice increases. If one or more of them is missing, information exchange quickly becomes dependent on manual steps, local knowledge or temporary translations.

This is precisely why interoperability cannot be reduced to a question of technology. It rests simultaneously on identity, structure, format and governance.

6.7 Event data – when it is not enough to know what the product is

In DPP, it is sometimes not sufficient to describe the fixed characteristics of the product. Information is also needed about what happens to the product over time. This may concern manufacturing, delivery, receipt, installation, repair, return or recycling.

Such information differs from static product data. It describes not only what the product is, but also what has happened to it. This makes traceability event data central to interoperability in DPP, particularly when traceability and the lifecycle perspective become important.

When products are to be followed through several stages, traceability events need to be expressed and interpreted in a common way. Otherwise, the history remains local to each system and difficult to use in a larger context. Interoperability in DPP therefore concerns not only attributes and product descriptions, but also how changes, movements and lifecycle events can be shared.

6.8 The role of GS1 in interoperability

This is where GS1 standards often take on a broader significance than many initially realise. GS1 standards are not only relevant to identification and data carriers. They are also relevant because they include standards for how information can be shared between actors.

This means that GS1 standards can contribute to interoperability at several levels: through shared identities, shared data models, shared rules for how information is expressed and standards for sharing and interpreting events.

For many companies, this is crucial, because it makes it possible to work with information exchange without every relationship requiring its own specialised logic. GS1 therefore becomes not only a standard for marking products, but part of the structure that enables data to continue to exist between multiple users and multiple systems.

6.9 From data sharing to shared information logic

This is one of the most important changes in thinking in the entire DPP work. It is not enough to say: “We share data.” The question is instead whether the data is shared in a way that allows others to use it directly.

When the answer is yes, the organisation has come a long way. When the answer is no, the same problems often arise repeatedly: additional translation layers, manual checks, local adaptations and difficulties in scaling up.

The objective is therefore not only data sharing, but shared information logic. It is only when different actors can work with the same information structure without having to reinvent the relationship each time that DPP begins to function as intended.

6.10 Choices an economic operator needs to make

When an organisation is to build interoperability in DPP, several important choices arise. A company needs, for example, to decide whether it should continue building specific solutions for each partner or invest in more generic structures. It also needs to determine whether the objective is primarily technical connection or genuine semantic understanding.

The question of short-term efficiency compared with long-term scalability also arises. A customised integration may be quick to build today but expensive to manage later. The organisation also needs to decide how much of the interoperability should be resolved in the central architecture and how much should be handled by each part of the operation, as well as whether DPP should be managed as a separate project or as part of the company’s broader information strategy.

These choices affect not only technology, but also the organisation’s future flexibility. Interoperability is therefore as much a business issue as an IT issue.

6.11 When interoperability becomes a competitive advantage

It is easy to see interoperability as something driven primarily by regulation. But in practice, it can also become a clear business advantage. An organisation with a high level of interoperability often finds it easier to connect new partners, make data sharing more efficient, reduce the number of specialised solutions, introduce new services and operate in more complex ecosystems.

An organisation with low interoperability, on the other hand, is more likely to experience higher integration costs, longer lead times, more manual interpretation and greater dependence on individuals and local solutions. This makes interoperability more than a technical quality. It becomes part of the company's strategic capability.

In DPP, this becomes particularly clear, because the value of product data increases the more effectively the information can move between actors without losing meaning or functionality.

6.12 A simple way of thinking

If Chapter 5 answered the question of how the information should be designed, Chapter 6 answers the question: how can that information begin to function outside the system in which it was created?

This is the core of interoperability. It is therefore not primarily about moving data. It is about creating a situation in which data can continue to exist and be used in several contexts.

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6.13 Brief summary

The most important points from the chapter can be summarised as follows:

- Interoperability means that systems can exchange and use information in a meaningful way.
- It requires technical, structural and semantic interoperability.
- Many organisations have integration, but not always genuine interoperability.
- DPP places high demands on information functioning between actors in an ecosystem.
- Traceability event data becomes particularly important when products are to be followed over time.
- GS1 can contribute to interoperability through shared standards for identity and information exchange.

6.14 Reflection questions

Consider the following before continuing:

- How do we share product information with other actors today?
- Are our integrations scalable, or are they based on many specialised solutions?
- Where in our flows does the greatest amount of interpretation and translation occur?
- What would need to be more standardised to make our data easier to share?
- Is interoperability primarily an IT issue in our organisation, or also a business issue?

Chapter 7

Traceability – how products are followed throughout the entire lifecycle

Chapter overview

In the previous chapters, the foundation for DPP has gradually been built. The product has been given an identity, the identity has been made accessible through a data carrier, the data carrier has been connected to information, and the information has been structured so that it can be understood and shared. This raises the next crucial question: how is the product followed over time?

This is where traceability becomes relevant. DPP is not only about knowing what a product is at a particular point in time. It is also about being able to understand what has happened to it, where it has been, which actors have been involved and what information becomes relevant in the next step. Traceability therefore becomes part of the product's digital life, not merely a specific function for control or recalls.

7.1 Traceability begins with a few simple questions

Traceability is fundamentally about being able to answer a few very concrete questions. Where does the product come from? What has happened to it? Where is it, or where has it been? Which actors have been involved? And what needs to be known about the product in the next step?

As long as a product is primarily regarded as something that is manufactured, sold and used once, traceability is often limited to production and delivery. The questions then primarily concern where the product comes from, when it was produced and how it reached the next stage of the value chain.

From a DPP perspective, the picture becomes broader. For certain products, it is also necessary to understand what happens after the product is sold. The product may be repaired, resold, upgraded, taken back, disassembled or recycled. Traceability then becomes not only a means of supporting control and delivery, but part of how the product is understood throughout its lifecycle.

At the same time, it is important to distinguish between two types of traceability. Upstream traceability concerns information from previous stages, such as materials, components, origin and production. It may be needed to produce the data to be included in the DPP in accordance with delegated acts. Downstream traceability concerns what happens to the product after it has been placed on the market, such as use, repair, reuse or recycling. It may be crucial for certain product categories, but less relevant or not regulated for others.

7.2 From point-in-time information to the lifecycle

To understand traceability, it is necessary to distinguish between two different ways of viewing product information.

The first is point-in-time information. This concerns information that describes the product at a particular point in time, such as its name, weight, material, model or manufacturer. This type of information helps us understand what the product is.

The second is lifecycle information. It describes what happens to the product over time, such as when it was manufactured, when it was sent, when it was received, when it was repaired, when it was returned or when it was recycled. This type of information helps us understand what has happened to the product.

DPP often needs both perspectives at the same time. Point-in-time information provides a stable description. Lifecycle information provides movement, history and context. Traceability arises through the interaction between the two.

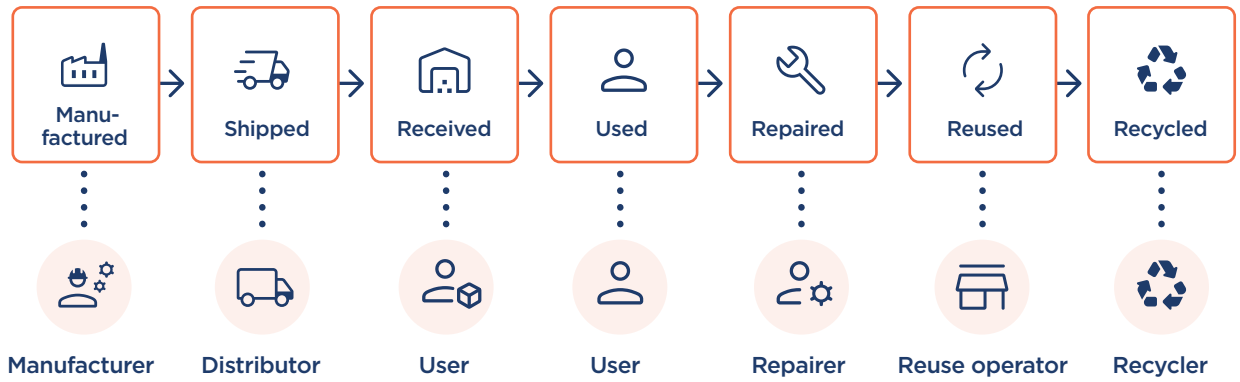


Figure 19. Events over time and throughout the lifecycle.

7.3 Why traceability is important for DPP

Traceability is not a new concept. Many industries have worked with traceability for a long time for safety, quality or logistics reasons. What changes with DPP is primarily the scope and use.

First, more actors need the information. Traceability should not only support the organisation itself, but several parts of the value chain. Second, more use cases are added. The information is not only to be used for control or recalls, but also for repair, sustainability work, circular flows and regulatory compliance. Third, the product's life becomes longer and more complex. As products are increasingly repaired, reused and recycled, the need to understand their history increases.

This means that traceability in DPP becomes more extensive than traditional traceability. It is no longer sufficient to be able to follow the product to the next stage. There is an increasing need to understand its journey through several stages of use, change and reuse.

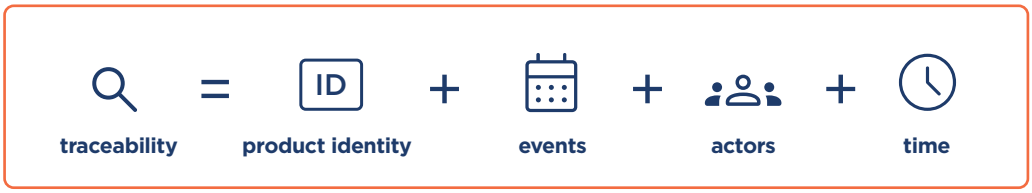


Figure 20. Traceability is a combination of identity, events, actors and time.

7.4 Why DPP makes traceability more important

Chapter 2 showed that products can be identified at model, batch or individual level. This is highly significant in traceability work.

If identification takes place at model level, a product category can be followed, but individual items cannot be distinguished. If identification takes place at batch level, groups of related products can be followed, for example products from the same production run. If identification takes place at individual level, a specific item can be followed throughout the entire lifecycle.

This means that the precision of traceability is always affected by how the identity is constructed. An organisation therefore cannot discuss traceability without also discussing granularity. Anyone who wants to understand what has happened to an individual product must also have an identity that makes this possible.

7.5 What often limits traceability in practice

Many organisations believe that they already have traceability, and this is often true to a certain extent. But when traceability is examined more closely, the limitations become clear.

These may include traceability only functioning within the organisation itself, events being recorded in separate systems without shared logic, the product identity not being consistent between different stages, the history being possible to find but only manually, or different actors describing the same event in different ways.

This means that traceability often exists as parts of a solution, but not as a coherent capability. DPP makes these limitations clearer, because the same information needs to function across more stages and for more purposes than before.

7.6 Events – the building blocks of traceability

A useful way to understand traceability is to view it as a chain of events. A traceability event describes that something has happened to the product. It may, for example, have been produced, packed, sent, received, installed, repaired, returned or recycled.

Each such event that is recorded becomes a piece of the product's history. When these events are expressed consistently and can be connected to the correct product, a traceable structure arises that can also be used outside the individual system in which the event was created.

This is precisely why traceability event information becomes so important in DPP. It makes it possible to move from a static description of the product to an understanding of the product's journey through time, use and change.

7.7 The role of GS1 in traceability

GS1 standards offer not only identities for products, locations and actors. GS1 standards also provide an established way of describing traceability events associated with products, primarily through EPCIS.

This is important because traceability can otherwise easily become divided between different systems and ways of working. One system may describe that a product has been sent. Another may describe that it has been received. A third may describe a return or repair. If each system uses its own logic, it becomes difficult to combine the events into a coherent history.

GS1 standards therefore become relevant here not only as an identification system, but as a structure for describing the product's journey in a way that others can understand and use as it travels through the value chain.

7.8 Traceability and the circular economy

One of the strongest arguments for DPP is its connection to circularity. For a product to be repaired efficiently, be used for longer, resold, taken back, disassembled and recycled with greater precision, it needs to be understood not only as a product, but also as a history.

In many cases, it is not enough to know what the product was when it left the factory. It may also be crucial to know which repairs have been carried out, whether important components have been replaced, whether the product belongs to a particular batch and which materials or processes affect the final stage.

Traceability makes this type of knowledge possible. This means that traceability is not only about control. It is also about creating the conditions for better use of resources. When the product can be understood through its history, it also becomes easier to make more informed decisions about continued use, take-back or recycling.

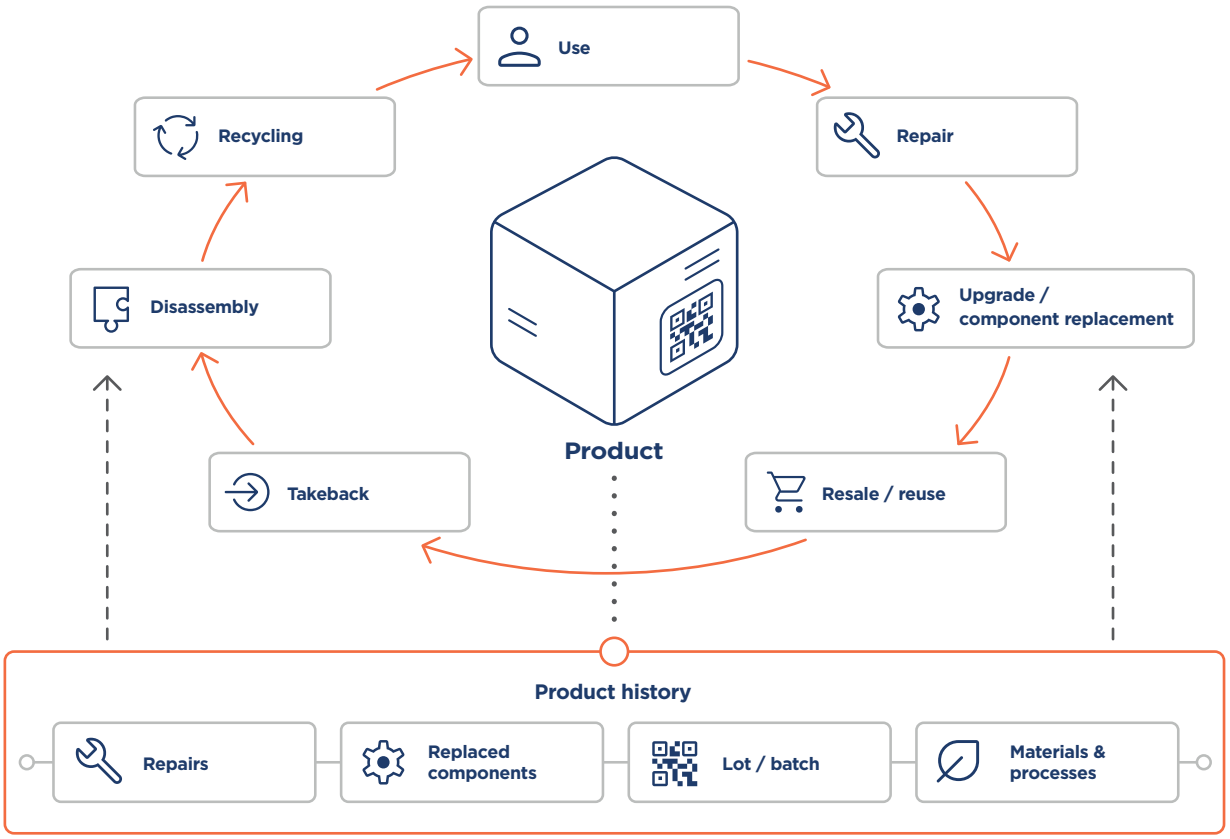


Figure 19. Events over time and throughout the lifecycle.

7.9 Choices an economic operator needs to make

When an organisation is to develop traceability in a DPP context, several strategic and practical choices arise. One of them concerns how far traceability should extend. Should it only cover production and delivery, or also use, repair and the end-of-life stage? Another concerns the level at which the product should be followed: model, batch or individual.

The organisation also needs to determine which events are most important. Do all traceability events need to be recorded, or only certain critical stages? It also needs to decide who is responsible for creating and sharing traceability data, and how much standardisation is needed. Should each system continue to describe events in its own way, or should the organisation move towards shared structures?

It is often sensible to begin with the events that provide clear value and then build further from there. This makes traceability both more usable and more manageable.

7.10 Traceability is also a question of trust

When several actors share information about a product, the question of trust also arises. Is the information correct? Is it complete? Does it refer to the correct product? Has it been recorded consistently? Does it contain business-critical information that should not be accessible to everyone?

Traceability is therefore closely connected to the next chapter on data governance. Put simply: traceability shows what has happened, while governance helps us trust that what is shown is reasonable and correct.

This is important because the value of traceability quickly decreases if users do not trust the history or do not know how it was created.

7.11 A simple way of thinking

If Chapter 5 answered the question of how the information should be designed, and Chapter 6 answered the question of how it can be shared between actors, Chapter 7 answers the question: how can we understand the product's journey over time? This is the core of traceability.

7.12 Brief summary

The most important points from the chapter can be summarised as follows:

- Traceability concerns understanding what has happened to the product over time.
- DPP makes traceability more important because more actors and more use cases are added.
- Events are the building blocks of a functioning traceability model.
- Granularity affects how precise traceability can become.
- GS1 can contribute through standardized identities and traceability event structures.
- Traceability supports not only control, but also repair, reuse and circularity.

7.13 Reflection questions

Consider the following before continuing:

- How far can we follow our products today?
- At what level does our current traceability take place: model, batch or individual?
- Which traceability events do we already record, and which are missing?
- Where is the history broken between actors or systems?
- Where would better traceability create the greatest value in our operations?

Chapter 8

Data governance – responsibility, quality and control over information

Chapter Overview

In the previous chapters, we have built up a structure for DPP. The product has been given an identity, the identity can be carried in a data carrier, the data carrier leads to information, the information can be structured and shared, and the product's journey through the lifecycle can be followed. Now comes a question that often determines whether all of this actually works in practice: who is responsible for ensuring that the information is correct, up to date and reliable?

This is where data governance comes in. The term may sound administrative or technical, but fundamentally it concerns something very practical: how information is governed so that it can be trusted. In a DPP context, this becomes crucial because the same information is often used by several actors, in several systems and over longer periods of time than before. Governance is therefore not something that is added at the end. It is a prerequisite for the entire structure to hold together.

8.1 What is meant by data governance?

Data governance can be described as the principles, roles and working methods that allow information to be managed in an orderly way. It concerns questions such as who owns the information, who is permitted to change it, how it is known to be correct, how updates are managed and what happens when different systems display different information.

In simpler information environments, such questions can sometimes be handled informally. But in DPP, this becomes more difficult. When information needs to be shareable, traceable, understandable and usable over time, it is not enough for the data to "exist somewhere". It must also be clear how it is governed and who is responsible for it.

Data governance is therefore not only about order for the sake of order. It is about creating an information environment in which data can be used with sufficient trust.

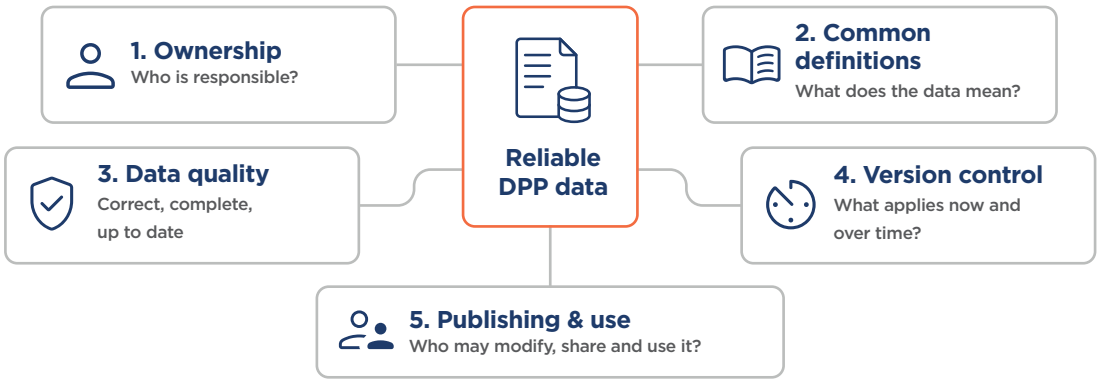


Figure 22. Reliable data is the foundation of a credible DPP.

8.2 Why governance becomes crucial in DPP

In a closed internal environment, certain information problems can remain hidden for quite a long time. It may, for example, work reasonably well even if the same information exists in several versions, the division of responsibility is unclear, updates are made irregularly or different departments use different definitions.

But when information is to be used in DPP, such weaknesses quickly become apparent. This is because DPP is based on data being shareable, understandable and usable by more people than those who originally created it. The more actors who use the information, the greater the need for order. What could previously be handled through habit, dependence on particular individuals or local solutions then becomes a structural problem.

This is why governance is not an additional layer on top of DPP. It is a fundamental part of the structure that allows the information to remain usable as it moves between systems, functions and organisations.

8.3 Good data is not only created in systems – it is created through working methods

It is a common misconception that data quality is primarily a technical issue. Technology naturally plays a role, but much of the quality is determined long before the information reaches a system.

Data quality is affected by how responsibility is allocated, how concepts are defined, how updates are managed, how errors are detected and corrected and how different functions collaborate. This means that governance is as much about organisation and working methods as it is about IT.

Put simply: systems can store data, but governance determines whether it is credible. If the working methods are unclear, advanced technology only helps to a limited extent. And if the working methods are well considered, even a complex information environment can become significantly more reliable.

8.4 What usually goes wrong when governance is lacking

When the governance of data is weak, certain problems tend to recur. They often first appear as irritation in everyday work, but in a DPP context they have greater consequences.

A common sign is that there are several versions of the same truth. Different systems display different information about the same product. Another is unclear responsibility. No one really knows who should update or approve particular information. It is also common to lack shared definitions, with the same term being used but meaning different things in different parts of the organisation.

A further problem is that it becomes difficult to correct errors. It may be clear that something is wrong, but unclear where the error arose and who should handle it. Eventually, trust in the information becomes low. Users begin to double-check data manually because they no longer fully trust it.

In DPP, such problems become particularly serious because the information is often used outside the environment in which it was created. Shortcomings in governance then become not only internal inefficiencies, but obstacles to sharing, interoperability and traceability.

8.5 “Single source of truth” – useful but not always simple

In many discussions about data governance, the expression “single source of truth” appears. In practice, it means that there should be a clear and recognised source for particular information. The idea is reasonable: the same information should not be defined in many different places, updates should be made in the correct source and other systems should reuse the information instead of creating their own versions.

But in reality, this is not always simple. Larger organisations often have several systems with different purposes, local processes, historically developed solutions and different ownership of different parts of the information.

For this reason, “a single truth” sometimes needs to be understood more practically. The objective is not always a single system. Rather, the objective is a clear source and clear rules for which version applies. This is often a more realistic and useful ambition. Governance is therefore not necessarily about reducing everything to one system, but about creating clarity regarding which information is authoritative and how it should be used further.

8.6 Roles and responsibilities – who does what?

One of the most important areas of governance is the division of responsibility. If no one owns the issue, quality often suffers. If too many people believe they own it at the same time, problems also arise.

In practice, organisations need to clarify roles concerning who defines data, who creates or records it, who approves it, who publishes it, who is permitted to change it and who monitors its quality. This does not mean that

all companies must use exactly the same role names. But the responsibility must be clear.

In DPP, this is particularly important because the same information often affects several functions simultaneously, such as business operations, sustainability, quality, production, logistics, IT and the aftermarket. If responsibility is not clear between these areas, the data quickly becomes difficult to govern. Governance then becomes not only a matter of documentation, but of coordination between the different parts of the organisation.

8.7 Data changes – governance must therefore be continuous

A common mistake is to regard product data as something static. But in practice, it often changes over time, particularly when a product model is updated. This may be because materials are replaced, the design is changed, new requirements are added, new interpretations are made or information in the DPP needs to be updated.

This means that governance cannot be based on the idea that the data is "set once and for all". Instead, governance needs to be able to handle questions such as when data should be updated, how history should be preserved, how it is known which version applies and how changes are communicated to other systems or actors.

In DPP, this becomes particularly important because the product often exists for longer than an individual internal process. Governance therefore needs to function not only during implementation, but over time and through change.

8.8 Governance across organisational boundaries

In many information environments, governance remains within the company. In DPP, this is not always sufficient. Because several actors may contribute to or use the same information, certain parts of governance need to function between organisations.

This applies particularly when there is a need to coordinate identities, data definitions, update logic, responsibility for lifecycle events and access to information. This does not mean that everyone must share the same internal governance model. But it does mean that there needs to be sufficient order for collaboration to function.

This is where standards become important again. They create a common foundation even when internal working methods differ. Governance in DPP therefore becomes not only an internal management issue, but also a question of how collaboration can be made sufficiently clear and reliable between different parties.

8.9 The role of GS1 in data governance

GS1 does not resolve the entire governance issue for an organisation. But GS1 standards can contribute to better order by providing established structures for identities, terms, data models, the publication and sharing of information and event-based information flows.

This is important because governance becomes much easier when several actors already use the same basic structure. For an organisation, this means that GS1 standards can help reduce the number of local interpretations, create more consistent information management, clarify how data should be expressed and shared and make it easier to build trust in the information.

The use of GS1 standards therefore does not replace internal governance, but can function as a stable structure around which governance can be organised. This makes a difference, particularly when information needs to function both internally and in a broader ecosystem.

8.10 Quality and trust are connected

There is a close connection between governance and trust. If users repeatedly encounter information that is incomplete, contradicts other data, lacks a clear owner or is difficult to interpret, trust decreases.

When trust decreases, two things often happen. First, more manual checks are introduced. Second, the value of digitalisation decreases because users no longer dare to trust that the systems actually provide the required quality.

In DPP, this is particularly important because the product needs to be followed and understood in several contexts. If trust in the information is low, much of the benefit is lost. Governance is therefore not only about control. It is also about creating an information environment that people and systems actually dare to use.

8.11 Choices an economic operator needs to make

When an organisation begins working more actively with governance in DPP, several important choices arise. One of them concerns the balance between central governance and local autonomy. How much should be governed jointly, and how much should each part of the organisation be permitted to manage itself?

Another choice concerns the level of ambition. Should the organisation wait for a completely finished governance model, or begin with clear basic principles and develop them over time? A further question arises as to whether governance should primarily be designed to achieve regulatory compliance or also to improve information in everyday operations.

The organisation also needs to decide whether data governance should be regarded as an IT responsibility or as a shared business responsibility. Finally, it must decide whether it is sufficient for the organisation itself to consider the data good, or whether it also needs to be perceived as credible by others.

It is often in these choices that an organisation's actual maturity in its DPP work becomes apparent.

8.12 A simple way of thinking

If Chapter 7 answered the question of how we follow the product over time, Chapter 8 answers the question: how can we trust the information that we follow?

This is the core of the governance issue. Data governance is therefore not an additional layer on top of DPP. It is what makes the structure actually hold together.



8.13 Brief summary

The most important points from the chapter can be summarised as follows:

- Data governance concerns how information is governed, owned, updated and quality assured.
- In DPP, this becomes particularly important because several actors use the same information.
- A lack of responsibility and structure often leads to several versions of the truth.
- Governance needs to function over time, not only during implementation.
- GS1 standards can be used as a supporting structure for more orderly data governance.
- Trust in data is a prerequisite for DPP to create real value.

8.14 Reflection questions

Consider the following before continuing:

- Who is responsible for our product information today?
- Where are the greatest differences between different systems or departments?
- How do we manage incorrect or contradictory information?
- What in our current governance creates the most trust, and what creates uncertainty?
- Where would clearer roles or a more standardised structure make the greatest difference?

Chapter 9

Implementation – from idea to a functioning DPP solution

Chapter Overview

In the previous chapters, we have built up DPP as a structure. The product has been given an identity, the identity can be carried in a data carrier, the data carrier leads to information, the information can be structured and shared, the product's journey through the lifecycle can be followed and responsibility and quality can be governed through governance. This raises the question that many organisations sooner or later face: how is all of this implemented in practice?

This chapter concerns implementation, but not as a general step-by-step model. What an organisation should begin with depends on its current situation, maturity, industry, products, system landscape and regulatory exposure. For some, the identity issue is the most urgent. For others, it is data quality, marking, traceability or the division of responsibility. Implementation in DPP should therefore not be understood as a linear template that looks the same for everyone, but as work in which a number of choices, priorities and maturity issues need to be managed consciously.

9.1 Implementation rarely begins where one expects

When organisations begin discussing DPP, the focus often quickly shifts to technology. Questions about platforms, publication, types of codes and interfaces arise early because they are concrete and easy to visualise. But in practice, implementation rarely begins there.

It more often begins with a different type of question. What do we already have in place? What already works sufficiently well? Where are our greatest gaps? Which parts of the organisation are mature, and which are not? What needs to be clear in order for the rest to become possible?

This means that DPP implementation almost always begins with an understanding of the current situation, not with the choice of tools. An organisation that moves too quickly to a solution otherwise risks building a new structure on top of old ambiguities.

9.2 DPP is not an IT project

It is important to state this clearly: DPP may use a great deal of technology, but DPP is not only technology.

It affects several parts of the organisation simultaneously: business logic, product governance, sustainability work, information management, marking, data sharing and collaboration with external actors. Implementation therefore almost always becomes cross-functional.

If DPP is managed as a purely IT initiative, there is a clear risk that the technology will be built without sufficient business logic, that the data will lack clear ownership, that users will not be ready or that the solution will function technically but not organisationally. This does not mean that IT is less important. On the contrary. But it does mean that technology must be implemented as part of a broader change in structure, responsibility and working methods.

9.3 The current-state picture – the foundation for reasonable decisions

Many organisations underestimate the value of first creating a clear picture of the current state. This is a mistake, because it is only when the current situation becomes visible that the implementation can be prioritised wisely.

A useful current-state picture helps the organisation understand which identities are already used, which data carriers are in place, how product data is currently structured, which systems hold which information, how information is exchanged with external actors and where responsibility already exists – or is lacking.

Without this overview, the risk increases that the organisation will build duplicate solutions, introduce a new structure on top of old problems, invest in the wrong things first or underestimate how much change work is actually required.

The current-state picture is therefore not a formal preparatory activity alongside the implementation. It is part of the implementation.

9.4 There is no universal starting point

It is tempting to want a clear model for where one should always begin. But in DPP, it is rarely helpful to commit to a universal order. An organisation with a strong identity structure but a weak data model needs to begin somewhere different from an organisation that has good data models but inadequate marking. A company facing high regulatory pressure in a particular product category will make different priorities from a company primarily driven by internal efficiency or future business models.

This makes implementation more demanding, but also more realistic. Instead of asking for a general order, the organisation needs to ask where the greatest dependencies exist, where the benefit can become clearest and which shortcomings currently restrict development the most.

This means that implementation is often most effective when it is based on maturity and context rather than on an abstract ideal model.

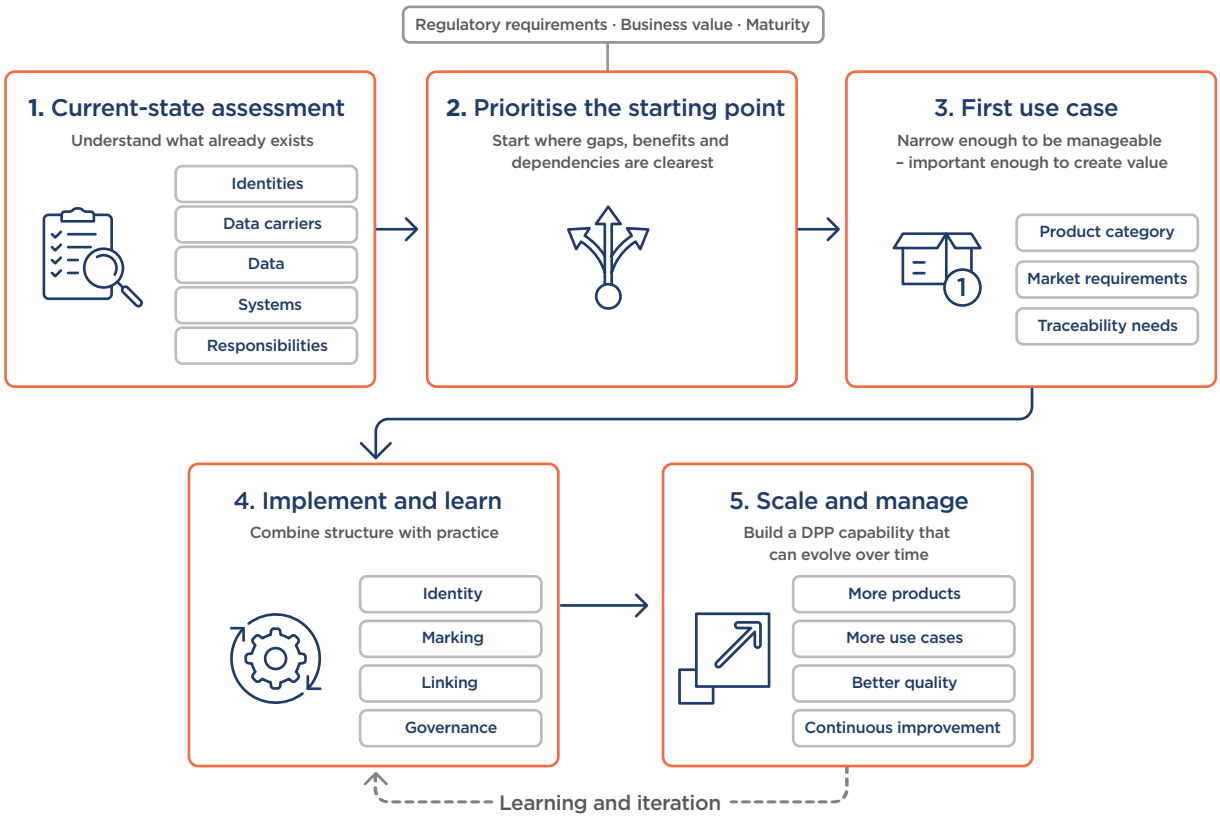


Figure 23. From the current state to scalable DPP capability through learning.

9.5 What often creates friction

When DPP is to be implemented, friction often arises in a number of recurring areas. One of them is unclear responsibility. No one owns the whole, or several people believe that someone else does. Another is too many local solutions, where each part of the organisation has developed its own way of managing products and data.

It is also common for organisations to overestimate the role of technology and believe that a new system will solve problems that actually concern structure and working methods. At the same time, the change work is often underestimated. It is assumed that users will adapt automatically once the technology is available, even though real change generally requires clarity, responsibility and engagement.

Another recurring source of friction arises when the connection between regulatory requirements and business benefit is weak. DPP then appears to be an obligation rather than something that can also improve data quality, coordination and long-term capability.

Recognising these obstacles early makes a major difference because it helps the organisation distinguish between problems that can be solved with technology and problems that must be solved through governance, prioritisation and collaboration.

9.6 Use cases as a way in – but not as the only logic

It is often wise to begin with a clear use case. It may be a particular product category, a specific market requirement, a concrete traceability need or a situation in which marking and linking need to function better. The point is not to start small for its own sake, but to begin where the benefit can be made clear.

A good first use case is often important enough to create engagement, limited enough to be manageable and rich enough to teach the organisation something that can be used further.

At the same time, it is not sufficient to think only in terms of use cases. A use case can create momentum, but if it becomes completely isolated from the broader structure, there is a risk that it will simply become another local solution. Implementation therefore needs to connect the concrete and the structural: something must begin somewhere, but what is built should be capable of continuing beyond the first context.

9.7 Implementation is also prioritization

When DPP becomes concrete, organisations quickly realise that everything cannot be done at the same time. Questions of prioritisation then arise. Should the focus be on identity or data quality? On marking or the information model? On regulatory compliance or business benefit? On central governance or local development? On developing internally or building on established standards and solutions?

There is no universally correct answer. But a clear pattern recurs: organisations are more successful when they prioritise on the basis of both benefit and structure. If they only follow what feels urgent, there is a risk that the solution will be short-term. If they only build structure without a clear benefit, there is a risk that the organisation will lose interest and momentum.

Good implementation therefore needs to hold both perspectives together. What provides rapid benefit should, as far as possible, also contribute to long-term order. And what builds structure should, as far as possible, be justified by real use needs.

9.8 A practical checklist for the current state and readiness

Instead of a universal implementation model, it is often more useful to work with control questions that help the organisation understand where it stands and what needs to be clarified. Examples of such questions are:

- Do we have a clear picture of which product identities are already used?
- Do we know which data carriers are present on products, packaging or documentation?
- Is it clear which information is structured and which is primarily free text?
- Do we understand how data is currently shared with external actors?
- Have we clarified who owns, updates and publishes central product information?
- Do we know which regulatory requirements are most relevant to our products now and in the future?
- Have we identified where our greatest dependencies and bottlenecks exist?
- Is there a use case in which we can both create benefit and learn something important?

Such a checklist does not replace analysis, but it helps the organisation make decisions based on a more realistic picture of its own situation.

9.9 Choices an economic operator needs to make

When DPP moves from idea to implementation, several crucial choices arise. One of the most fundamental is whether to build something new or build on what already exists. How much of the existing structure can be used, and what needs to change?

Another choice concerns governance. Should implementation be driven centrally, or begin in a limited area where maturity and benefit are clearer? Then comes the question of the driving force: should implementation begin with a clear compliance need, or in an area where the business benefit is easy to demonstrate? The organisation also needs to decide whether it should begin by selecting a platform, or by clarifying identity, data and responsibility. Finally, the question of ambition arises: should it build a minimal solution for today's needs, or attempt to create a foundation that can support more requirements and uses over time?

These choices do not need to be resolved once and for all, but they do need to be made consciously. It is often precisely in these choices that the difference arises between short-term implementation and a long-term sustainable capability.

9.10 GS1 standards as support in implementation

For many organisations, GS1 standards become particularly important during the implementation phase. This is because GS1 does not only provide standards in theory, but also a practically usable structure that can be used in several parts of implementation: identity, data carriers, linking, attributes, information exchange and traceability.

This means that the organisation can, in many cases, reuse existing identities, build on already familiar marking principles, avoid inventing proprietary formats where established ones already exist and reduce the number of local specialised solutions.

This does not automatically make implementation simple. But it can make it clearer, more scalable and less risky. For many organisations, GS1 standards therefore become not only technical references, but a way of creating order in an implementation that could otherwise easily become fragmented between different initiatives and local needs.

9.11 When practice builds knowledge – more than perfect plans

In complex changes, there is often a strong desire to first create the perfect target state. This can be wise up to a certain point, but for DPP there is also clear value in learning through practice. When the organisation begins testing its assumptions in real contexts, it often becomes clearer where the identity logic is inadequate, how data carriers function in practice, how users actually behave, where data is missing and what needs to be strengthened in governance.

This does not mean that all organisations need to work with formal pilot arrangements. But it does mean that implementation benefits from including learning loops. DPP should not be understood as something that is first fully planned and then implemented exactly according to the design. Rather, it is a capability that develops through a combination of structure, experience and gradual adjustment.

9.12 Implementation over time – not a one-off project

It is important to regard DPP as a capability that is built up and matures over time. The requirements develop, delegated acts are added, more product groups are covered, the use cases grow and the organisation learns more during the journey.

This means that implementation should be designed so that it can be developed further. A solution that is optimised only for today's needs risks becoming an obstacle later. The organisation therefore needs to ask not only how DPP should be implemented, but also how what is implemented can continue to exist, change and deepen.

This is an important distinction. Implementation in DPP is not only about delivering a project. It is about building a foundation that can be used and developed further over time.

9.13 A simple way of thinking

If Chapter 8 answered the question of how we can trust the information, Chapter 9 answers the question: how do we make all of this work in our organisation?

This is the core of implementation. It is not only about installing something new. It is about moving the organisation from its current state towards a more coherent product and information logic.

9.14 Brief summary

The most important points from the chapter can be summarised as follows:

- DPP implementation requires more than technology; it requires changes in structure, responsibility and working methods.
- A clear picture of the current state is often more important than a rapid system choice.
- There is rarely a universal starting point; where one begins depends on the organisation's maturity and context.
- Clear use cases can create learning and momentum, but need to be connected to long-term structure.
- Prioritisation is about balancing business benefit, regulatory requirements and long-term sustainability.
- GS1 standards can provide a stable foundation on which to build during implementation.

9.15 Reflection questions

Consider the following before continuing:

- Where do we stand today in relation to DPP?
- What do we already have in place that we can build on?
- What is our clearest first use case?
- Where is the greatest risk: in the technology, the data or the organisation?
- What do we need to clarify before making larger investments?



Chapter 10

Business value – when DPP becomes more than a regulatory requirement

Chapter Overview

The previous chapter concerned how DPP can actually be implemented in an organisation. We will now take the next step and ask a different question: why would an economic operator want to do more than what is absolutely necessary?

This chapter concerns business value. Not in the sense of general promises about digitalisation, but in a more concrete sense: what DPP can actually improve in the organisation, why better structure often creates value far beyond regulatory compliance itself, how standardisation can reduce costs and increase flexibility and why DPP can also become a strategic asset. The question is therefore not only what DPP costs, but what the organisation risks missing out on if the work is reduced to a minimum.

10.1 The first mistaken assumption: viewing DPP as an obligation

When new requirements arise, it is natural for organisations to first think in terms of compliance. The questions then often become: what must we do, how little can we do to meet the requirements and how quickly can we put this in place?

This is an understandable perspective. But if DPP is viewed only in this way, there is a clear risk that the organisation will build something that meets the minimum level, functions for a very narrow purpose and quickly becomes difficult to develop further. This may be rational in the short term, but it is often an expensive way of thinking in the longer term.

A more strategic perspective is instead to ask what in this work could also strengthen the organisation. What investments do we need to make in product data, identity and information flows in any case? How can we build so that the solution not only meets the requirement, but also creates benefit? This is where DPP begins to move from cost to investment.

10.2 When structure creates value

Many of the benefits of DPP do not come from an individual function, but from several parts of the organisation beginning to work better together. When products are identified more clearly, information is structured better and data can be shared more consistently, improvements arise that are noticeable in everyday work.

These may include fewer ambiguities regarding product identity, less manual work to find and correct data, easier collaboration between functions, better traceability and higher-quality information used in several processes. It is important to understand that the business value of DPP often does not lie in “a new function” in itself. It lies in making product information more usable wherever it is needed.

This is also the reason why the value can sometimes be difficult to see at the beginning. It is not always visible as an individual new service or a single new system, but as less friction, better flows and more reliable use of information throughout the organisation.

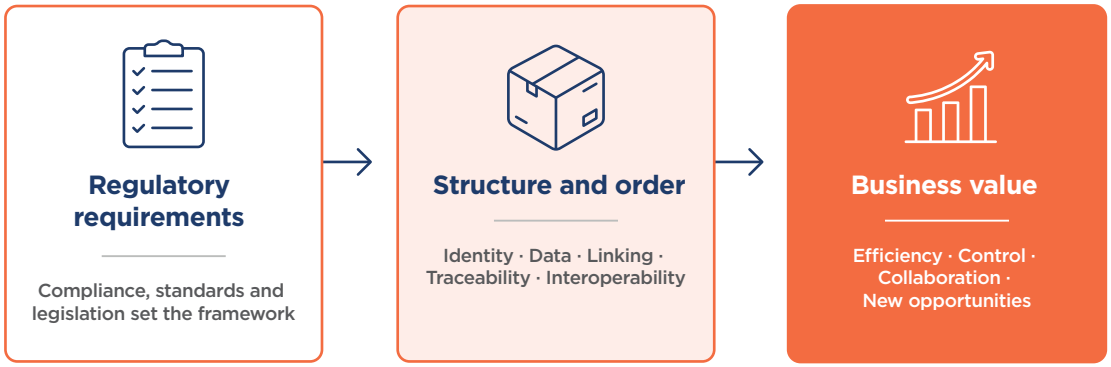


Figure 24. From regulatory requirements to business value through structure and order.

10.3 Four common types of benefits

DPP can create benefits at several levels simultaneously, and this is precisely why the value is often greater than first expected.

The first type is operational benefit. This concerns greater efficiency in the organisation's everyday work. Less duplicate registration, fewer translations between systems, faster access to the correct information and better order in product data are typical examples. This is often the most concrete benefit because it is directly noticeable in working methods and lead times.

The second type is quality and control benefit. This concerns reducing uncertainty. Better traceability, easier management of deviations, greater certainty about which information applies and a better basis for decisions are examples of this. When the data becomes clearer and more consistent, the need for guesswork and manual checks decreases.

The third type is collaboration benefit. DPP can make it easier to work with other actors by reducing the need for specialised adaptations and improving information exchange. In practice, this may mean easier connection to partners, fewer local solutions and greater interoperability.

The fourth type is strategic benefit. This concerns what the organisation can build upon over time. It may include new services, stronger customer relationships, better support for circular business models or greater flexibility in relation to future requirements. Not all companies will experience all of these benefits equally strongly, but it is important to recognise that the business value is often broader than regulatory compliance itself.



Figure 25. Four different types of benefits that DPP can create for your organisation.

10.4 From product data as a cost to product data as an asset

In many organisations, product data has long been regarded as something that must exist, but that does not in itself create value. This can lead to a fairly defensive way of working in which data is kept to a minimum, structure is regarded as a necessary evil and updates are made only once problems have already arisen.

DPP challenges this perspective. When data begins to be used in more contexts, its significance changes. Product information then becomes not only something that supports individual processes, but an asset that can be reused, utilised further, combined with other information flows and support new business logic.

This does not mean that all data suddenly becomes strategic. But it does mean that the right data, in the right structure, can become part of the company's competitiveness. When product information is clear, shareable and credible, it can be used in more ways than those for which it was originally created.

10.5 Efficiency – an underestimated benefit

When DPP is discussed, the focus often falls on transparency, sustainability and compliance. These are important areas. But one of the most underestimated benefits is often pure efficiency.

When product information becomes more orderly, it often means that fewer questions need to be resolved manually, fewer information errors arise, the same data can be used in more processes, responsibility becomes clearer and lead times are reduced. This may not always be as visible as a new customer service or a new digital service, but over time this type of improvement can create very significant value.

For many economic operators, it is therefore wise not only to ask what DPP costs, but also what the current lack of order costs. The latter is often significantly more difficult to measure, but at the same time much more decisive for the organisation's actual efficiency.

10.6 DPP and business models

There is also a more long-term level of business value. When products are given a better digital identity, a clearer information structure and better traceability, it becomes easier to develop business models that were previously more difficult to realise.

This may, for example, involve repair as a service, product as a service, take-back and reuse, a better aftermarket, greater precision in spare-parts management or trust-building information for customers or partners.

This does not mean that every DPP initiative automatically leads to new business models. But it does mean that an organisation that builds a strong information foundation gains more strategic opportunities than an organisation that is content merely to meet a requirement.

It is precisely this difference that makes DPP interesting from a business perspective. What begins as an information structure can later become an enabler for entirely different types of offerings.



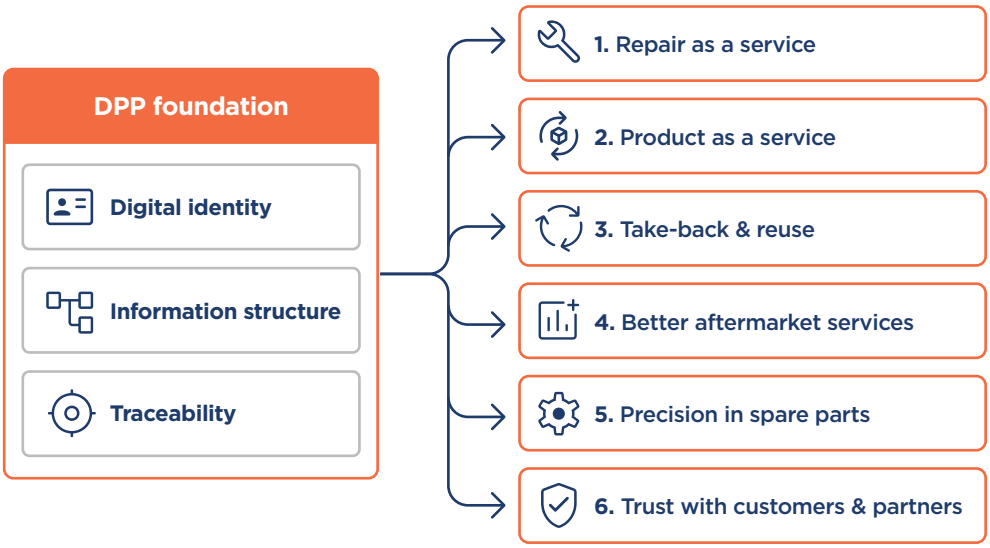


Figure 26. DPP as a foundation for new business models.

10.7 Why standardisation also creates business value

It may be tempting to view standardisation as something that only restricts opportunity and freedom. But in DPP, standardisation often creates business value precisely because it reduces friction.

When standards are used, it becomes easier to connect new actors, reuse solutions, reduce dependence on proprietary specialised formats and introduce changes with lower risk. This applies particularly when the organisation works in broad value chains or in international markets.

GS1 standards become relevant here because many of the building blocks required by DPP already exist within an established and widely used system. For an economic operator, this may mean faster implementation, less need to invent proprietary structures, better opportunities to collaborate with others and lower future integration costs.

This is a clear example of how standardisation and business value can be connected. What may initially be perceived as adaptation to a common structure often proves in practice to be an investment in future flexibility.

10.8 When business value fails to materialize

It is also important to state that business value does not arise automatically. DPP does not create benefit merely because information is published or because a code is placed on a product.

Business value often fails to materialise when the solution is built only for the minimum possible level of regulatory compliance, when data quality is low, when responsibility is unclear, when the structure cannot be reused, when the use cases are too unclear or when the organisation does not connect DPP to real business needs.

This means that business value should not be regarded as an additional outcome that one hopes for. It needs to be built into the way implementation is prioritised and designed from the outset. DPP becomes most valuable when the organisation not only asks what must be delivered, but also what can be improved by doing this in a considered way.

10.9 Choices an economic operator needs to make

When DPP begins to be viewed from a business perspective, several important choices arise. One of them concerns whether DPP should be developed as a purely compliance-focused track or as a foundation capable of supporting more uses. Another choice concerns whether DPP should exist alongside other development or be connected to ongoing work involving product data, traceability and customer value.

The organisation also needs to balance short-term cost against long-term benefit. How much should be invested now to avoid expensive rework later? A question of focus also arises: should DPP primarily improve internal processes, or should it also strengthen collaboration in the value chain? Finally, the organisation needs to consider whether product data is regarded as a reporting requirement or as a business asset.

These choices affect how DPP is shaped in practice. They also affect whether DPP becomes a minimum for compliance or a foundation for broader development.

10.10 A simple way to think

If Chapter 9 answered the question of how we put this in place, Chapter 10 answers the question: why is it worth doing properly?

This is the core of business value. DPP may be a requirement. But it can also be the beginning of a better and more usable information structure for the entire organisation.

DPP may be a requirement. But it can also be the beginning of a better and more usable information structure for the entire organisation.

10.11 Brief summary

The most important points from the chapter can be summarised as follows:

- DPP can create value far beyond regulatory compliance.
- Much of the benefit lies in better order, better data and better collaboration.
- Product data can move from being a cost item to becoming an asset.
- Standardisation can create business value by reducing complexity and increasing the ability to collaborate.
- GS1 standards are often relevant because they provide an established foundation on which to build.
- Business value does not arise automatically; it must be built into the implementation.
- GS1 standards can provide a stable foundation on which to build during implementation.

10.12 Reflection questions

Consider the following before continuing:

- Do we primarily regard DPP as a requirement or as an opportunity?
- Where in our organisation would better product information create the greatest benefit?
- Which part of the value is most important to us: efficiency, control, collaboration or new opportunities?
- Are we currently building solutions that can be reused, or only solutions that address today's minimum level?
- How would our work change if we regarded product data as an asset rather than an obligation?

Chapter 11

From structure to capability – building DPP as a long-term foundation

Chapter Overview

The previous chapters have shown how DPP is built step by step: products need to be identified, marked, linked to information, described using understandable data, shared between systems, followed over time and governed through clear responsibility. When these parts are brought together, a broader question arises: how can this be made into something that actually works within the organisation, throughout the value chain and over time?

This chapter addresses three perspectives — ecosystem, infrastructure and practical application. The point is simple: DPP should not be treated as an isolated project, an individual IT solution or merely a response to regulatory requirements. DPP needs to be developed as a long-term capability.

Consider the following before continuing:

- that the organisation can collaborate with other actors regarding product information,
- that there is a stable foundation capable of supporting several uses over time,
- that the organisation makes specific and well-founded choices concerning identity, data carriers, linking, data, traceability and standardisation.

It is only when these three perspectives are connected that DPP becomes more than an implementation. DPP then becomes a practical structure that can be used, managed, developed and create value over time.

11.1 DPP does not function in isolation

It is easy to think of DPP as something that each company implements for its own products. This is often how the work begins. An organisation reviews its products, identifiers, marking, systems and information.

However, it soon becomes clear that the product does not exist only within the organisation itself. It moves between several actors. Information about the same product may need to be used by manufacturers, importers, distributors, retailers, repairers, recyclers, authorities, customers and end users.

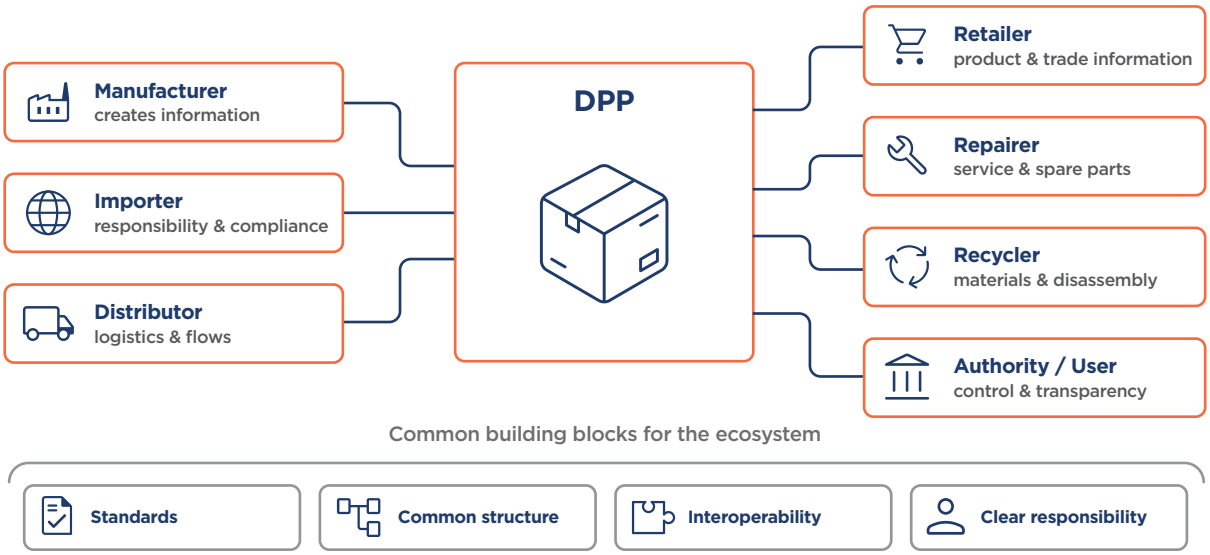
DPP therefore cannot merely be an internal information solution. It needs to function in relation to others.

This does not mean that all actors should see the same information or use it in the same way. An authority may need to verify certain information. A retailer may need trade and logistics information. A repairer may need service information. A recycler may need information about materials and disassembly. However, all of them need to be able to use a sufficiently clear and commonly usable foundation.

DPP is therefore not only about publishing product information. It is about making product information usable within a broader context.

When these parts are brought together, a broader question arises: how can this be made into something that actually works within the organisation, throughout the value chain and over time?

When these parts are brought together, a broader question arises: how can this be made into something that actually works within the organisation, throughout the value chain and over time?



11.2 From specialized solutions to a shared foundation

Many organisations already exchange information with customers, suppliers and partners. However, this exchange is often based on solutions that have developed over time: bilateral integrations, specific file formats, customer-specific requirements, local agreements and manual interpretations.

This may work when the number of relationships is limited. However, as more actors, product groups and use cases are added, the model becomes difficult to manage. Each new relationship requires adaptation. Each new data model requires translation. Each change in one system risks affecting several others.

DPP therefore raises an important question: how can several actors use product information without every connection having to be specially built?

The answer does not lie in a single technology, but in a shared foundation. Identities need to follow a clear logic. Data carriers need to be understandable to several actors. Data needs to be expressed more consistently. Linking needs to remain stable over time. Traceability needs to be based on events that can be interpreted outside the system in which they were created.

When this works, the need for specialised solutions decreases. DPP then becomes not only a set of requirements, but a structure for collaboration.

11.3 DPP needs to be built for more than the first requirement

At first, DPP may appear to be a project. This is natural. A project creates focus, responsibility, a timetable and resources. However, DPP rarely has a clear end in the same way as an ordinary project. Requirements develop. New delegated acts are introduced. More product groups may be covered. New use cases arise. Systems are replaced. More actors need to connect.

DPP therefore needs to be built so that it can continue to exist.

A solution that is optimised only for the first requirement may be quick to implement, but expensive to develop later. It may become dependent on a particular system, a particular file format, a particular manual process or a particular local interpretation. In the short term, this may appear efficient. In the longer term, it may create technical and organisational debt.

A more sustainable DPP structure therefore needs to function as a foundation. It must be capable of supporting several information needs, several product groups, several actors and several future uses without everything having to be rebuilt from the beginning.

This is what is meant by DPP needing to develop from a project into infrastructure.

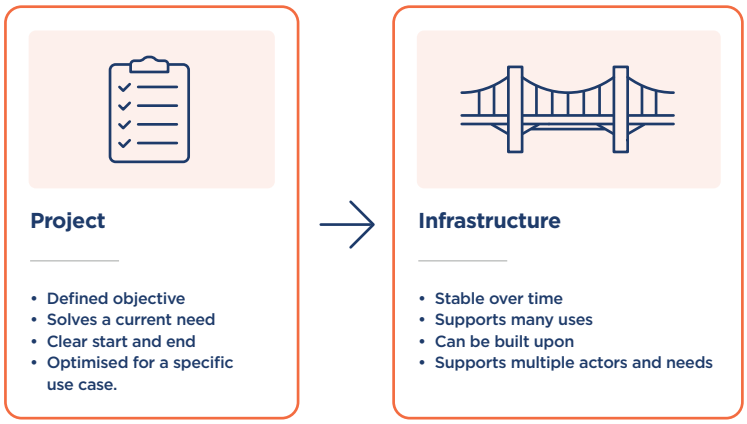


Figure 28. From project to digital infrastructure.

11.4 What a sustainable DPP foundation needs to support

A sustainable DPP foundation does not need to be complicated, but it does need to be well considered. Certain characteristics are particularly important.

It needs to be stable. The basic structure should not need to be changed every time a new use case, a new product group or a new requirement is introduced. It needs to be scalable. It must be capable of expanding to more products, more markets, more systems and more actors. It needs to be reusable. Identities, data carriers, data models and linking must be usable in several contexts, not only in an individual project. It needs to be interoperable. The information must be able to function between different systems and actors without every relationship requiring specialised adaptation. It needs to be manageable. It must be clear how the information is maintained, updated, quality-assured and developed further.

These are not additional quality features on top of DPP. They are prerequisites for DPP to function over time.

11.5 Build on areas where structure already exists

Many economic operators are not starting from scratch. Parts of the future DPP foundation often already exist within the organisation. These may include product identities, barcodes, 2D codes, master data, data exchange with partners, traceability information or systems for product information.

The most important question is therefore often not: what do we need to invent? The more important question is: what can we build upon?

Building on established structures can reduce risk, shorten implementation time and make the solution more recognisable to other actors. This applies particularly to DPP, where value often arises only when information can be used between organisations.

This is where GS1 standards often become relevant. They provide established building blocks for identity, data carriers, linking, master data, information exchange and event-based traceability. This does not mean that GS1 standards resolve the entire DPP issue. However, they can provide a practical foundation that is already in use in several of the areas where DPP requires continuity and interoperability.

11.7 Six practical choices that shape DPP

When DPP moves from understanding to action, the organisation needs to make certain fundamental choices. Together, these choices shape how DPP will function over time.

Consider the following before continuing:

1. **Select an identity logic**

   Determine which identity should be the primary identity for products, actors and locations. In a GS1 context, this may, for example, mean GTIN for products and GLN for parties and locations.

2. **Select a data carrier**

   Determine how the identity should be connected to the physical product. Data Matrix, QR codes, RFID and NFC may be used depending on the product and use case.

3. **Select a linking approach**

   Determine how the product should lead to digital information. GS1 Digital Link can be used to connect the identity to information and services over time.

4. **Select how data should be expressed**

   Product information needs to be structured so that it can be understood and used between systems and actors. Shared terms and data models make this easier.

5. **Select the level of traceability**

   Determine which level of granularity is needed: model, batch or individual level. The choice depends on the product, regulatory requirements and the desired benefit.

6. **Select what should be shared**

   Not everything needs to be standardised, but anything that needs to function between actors needs to follow shared principles. The objective is to standardise what needs to interact, without standardising everything.

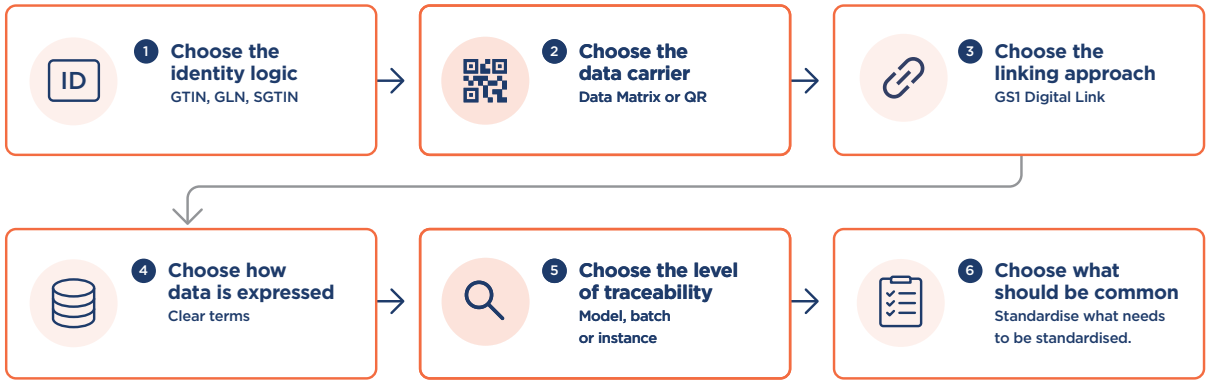


Figure 31. Six choices that shape DPP.

11.8 The organization's role and responsibility

When DPP begins to function in relation to other actors, a strategic question also arises: what role does the organisation want to have?

Some organisations will primarily create and publish information. Others will primarily use information. Some will build services on top of the information. Others will coordinate flows between several parties.

The same organisation may also have several roles simultaneously. It may be an economic operator under the regulation, an information owner in certain flows, a recipient of information in others and a user of traceability data in additional contexts.

It is therefore important not only to ask what the organisation must deliver. It also needs to understand what position it wants to have within the information landscape created by DPP.

11.8 Trust and dependencies

When product information is used by several actors, trust becomes crucial. The recipient needs to be able to trust that the information refers to the correct product, is up to date, has the correct meaning and comes from a responsible source.

This means that DPP requires more than technical access. It requires a clear allocation of responsibility, data quality, version management and shared principles for how information is expressed.

At the same time, DPP creates dependencies. If an important actor does not provide information, uses a different structure or has a low level of digital maturity, others are affected.

The organisation therefore needs to find a balance between openness and control, collaboration and independence, and shared structure and local adaptation.

Standards cannot eliminate all dependencies, but they can make them easier to manage.

11.10 What management needs to enable

DPP is not merely a technical issue. Management therefore does not need to select code structures or data models in detail, but it does need to create the conditions for the right decisions.

This means that management needs to support standards-based choices where they reduce risk and increase reusability. It needs to understand that decisions concerning identity, marking, linking and data affect business models, collaboration and future flexibility. It also needs to accept that it may sometimes be wiser to build a stable foundation than to choose the fastest solution for an individual requirement.

The role of management is not to control DPP in detail. It is to establish direction, responsibility and the level of ambition.

11.11 A simple way of thinking

DPP may begin as a requirement. It may be implemented through a project. However, to function over time, it needs to develop into a capability.

That capability is based on the organisation being able to do three things simultaneously:

- use a structure that other actors can understand,
- build a stable foundation that can be developed over time,
- make practical choices that create both value now and order for the future.

It is only then that DPP moves from being an implementation to becoming a long-term part of how the organisation manages products, information and responsibility.

11.12 Brief summary

The most important points from the chapter can be summarised as follows:

- DPP does not function in isolation, but needs to function between several actors.
- A sustainable DPP structure needs to be built for more than the first requirement.
- The organisation needs to distinguish between a stable foundation and varying applications.
- Many economic operators can build on structures that already exist.
- GS1 standards can provide practical building blocks for identity, data carriers, linking, data and traceability.
- DPP is shaped through specific choices concerning what should be shared, what can remain local and how the solution should continue to function over time.
- Management needs to establish direction and responsibility and support choices that reduce risk and increase long-term usability.

11.13 Reflection questions

Consider the following before continuing:

- Are we building DPP as an individual project or as a long-term capability?
- Which parts of our current structure can we build upon?
- Which actors need to be able to use our product information?
- Where are we most dependent on specialised solutions today?
- What needs to be shared for our DPP structure to function between actors?
- Which parts can remain local without harming collaboration?
- Which practical choice should we make first: identity, data carrier, linking, data, traceability or responsibility?

Appendix A

DPP for batteries, toy safety, PPWR and related regulations

This annex complements the main part of the handbook by showing how the logic behind Digital Product Passports also becomes relevant outside ESPR. Some regulations introduce an explicit passport or a Digital Product Passport solution. In other cases, the same terminology is not always used, but the requirements still concern the same fundamental questions: identity, data carriers, linking, data, access, traceability and responsibility. For an economic operator, it is therefore often wiser to think in terms of shared building blocks than entirely separate solutions for each regulation.

From an implementation perspective, the most important insight is that these areas should not be viewed as isolated special cases. Rather, they show that product information increasingly needs to function digitally between several actors, and that choices made in one structure often affect how easily the next requirement can be met. This makes the annex relevant both to organisations already working with ESPR and to those that first encounter DPP-like requirements in other regulations.

A.1 The Batteries Regulation – a sector-specific passport with a high degree of specificity

The Batteries Regulation is the clearest example of DPP logic outside ESPR. It does not concern a general product passport for all products, but a sector-specific battery passport with defined information requirements and a clear lifecycle perspective. For certain battery categories, this becomes a practical reality at an early stage, making the area particularly important for organisations working with electrification, mobility, energy storage or product categories in which the battery is a central component.

For an economic operator, several specific choices arise. The first concerns identity: should the battery only be recognisable at model level, or does each individual battery need to be distinguishable? The second concerns the data carrier: how should the identity and access be made practically available on the battery, its packaging or in associated documentation? The third concerns responsibility for information: who publishes, updates and quality-assures the information that is to follow the battery over time? The fourth concerns lifecycle logic: how far should traceability extend, and which events need to be connected to the battery during use, service, take-back and recycling?

GS1 provides several optional building blocks that can make implementation easier to understand. GTIN can be used where a global product identity is needed at model level. SGTIN or another serialised logic may become relevant when an individual battery needs to be followed as an individual item. GLN can be used to identify parties, facilities and locations in the information flow more clearly. Data carriers such as GS1 DataMatrix or GS1 QR Code can support practical access. Where there is a need for event-based traceability, EPCIS can provide a more consistent structure for describing what has happened to the battery throughout its lifecycle.

The important point is not that all organisations must select the same configuration, but that the Batteries Regulation makes it necessary to select a digital structure that will remain effective over time. For many economic operators, this also becomes an area in which GS1 can be used as a practical bridge between regulatory requirements and already established ways of identifying, marking and sharing information.

A.2 Toy safety – DPP as a safety and compliance tool

Within the area of toy safety, DPP has a different emphasis from that under ESPR. The focus is less on circularity and more on safety, compliance and market surveillance. This means that the passport or digital information structure primarily needs to support matters such as product conformity, safety documentation, chemical information and access to correct information for authorities and other relevant actors.

For the economic operator, this provides a clear example of how DPP does not always mean the same thing in every regulation. The same basic logic recurs, but the information content and use cases differ. The practical choice therefore concerns how the digital structure should support safety activities. Does the identity need to represent a model, a batch or an individual item? Should the data carrier primarily support market surveillance, or also consumer information and other use cases? How should documentation and safety information be expressed so that they are readable, shareable and capable of being followed up?

Here too, GS1 can provide clear options for action. GTIN can be used where the product needs a globally recognisable identity. Batch logic may be relevant where distinguishing between production series is important for safety monitoring. GS1-based data carriers can make it easier to create a clear connection between the toy, its packaging and the digital information that needs to be accessed. If the organisation already uses GS1 in other parts of its operations, this may reduce the need to create a separate marking and identity logic solely for toy safety.

The central point is that the toy sector demonstrates how DPP logic can be used for purposes other than sustainability performance. The lesson for the organisation is that the same structural building blocks can often be used even when the regulatory purpose is different.

A.3 PPWR – digital carriers, marking and information logic for packaging

The Packaging and Packaging Waste Regulation, PPWR, is not a direct copy of DPP under ESPR. However, it clearly moves in the same direction by imposing requirements concerning harmonised marking, data logic and, in some cases, digital data carriers, particularly where reuse, sorting and access to information need to be better supported. This makes PPWR an important area for organisations seeking to build a coherent structure for products and packaging.

For the economic operator, several highly specific choices arise. Should the packaging have its own identity and, if so, at what level? Is it sufficient to identify the packaging type, or does reusable packaging need to be followed as an individual object through several cycles? Should the data carrier primarily support sorting and user information, or also internal logistics, reuse and monitoring? How should the relationship between the identity of the product and the identity of the packaging be designed when both may need to carry relevant information?

GS1 also provides practical options here. The organisation can choose to use established identification keys to distinguish between products and packaging and use GS1 QR Code or other GS1-compatible data carriers where a digital entry point is needed. Where reuse systems or reusable packaging need to be followed over time, serialisation and event data may become particularly valuable. Actors that already use GS1 in trade and logistics therefore often have a clear opportunity to build on an existing structure instead of creating a separate PPWR logic.

PPWR also demonstrates something broader: DPP-like requirements do not arise only when a regulation explicitly refers to a product passport. They also arise when regulations require physical marking, digital access and shareable information to function more consistently throughout the value chain.

A.4 Additional areas – construction products and other product regulations

In addition to batteries, toy safety and PPWR, there are other areas in which the same logic is emerging. One clear example is the construction products sector, where digital product information and digital passports are becoming increasingly important for carrying performance information, safety information and instructions and, over time, providing better support for the building's combined information flow. This makes it particularly clear that DPP is not only a product issue, but also a question of how products should function within larger systems such as buildings, facilities and digital logbooks.

For economic operators in such environments, the choices often become more infrastructural. Should the product information be expressed so that it can be used both within the organisation's own operations and in other digital environments? Should the identity be able to continue to exist when the product moves from a design context to installation, operation, maintenance and replacement? How should the relationship between the product, location, actor and lifecycle event be expressed in a way that remains consistent over time?

Even when the regulations differ, the same practical question therefore recurs: should the organisation build many separate structures or build a shared foundation that can be used in several regulatory environments? For many organisations, this is precisely where the value of GS1 and other established standards becomes clearest.

A.5 What this means in practice for the economic operator

This annex points towards an important conclusion. Implementation outside ESPR rarely involves introducing an entirely new way of thinking for each regulation. More often, the same building blocks recur in different forms: identity, data carriers, linking, structure, access, traceability and responsibility. For an economic operator, the practical task is therefore to make deliberate choices about which building blocks should be shared and which need to be adapted for each area.

GS1 provides many of the choices that can be made in practice. The organisation can choose to build the identity around GTIN where appropriate, use GLN more clearly for parties and locations, use serialisation where individual-level identification creates genuine value, move towards GS1-based 2D codes where several use cases need to be supported, use GS1 Digital Link where the physical product and digital information need to remain connected over time and use EPCIS where events need to be expressed consistently between several actors.

The decisive factor is not that everything must be introduced simultaneously. The decisive factor is that the organisation selects a direction that makes it possible to continue building. Outside ESPR, this becomes particularly important because several regulations now point towards the same fundamental development: products, packaging and components increasingly need to be identified, understood and managed digitally in relation to more actors and over longer periods than before.

Appendix B

Further reading about GS1

For those who want to deepen their understanding of how GS1 standards can be used in DPP work, there are several key documents and resources. Together, they provide an overall picture of identity, marking, data, information exchange, traceability and architecture.

Link to the resource library: https://ref.gs1.org/

Overview and structure

GS1 System Architecture
Provides an overall picture of how the GS1 system fits together, from identities and data carriers to data sharing and use in different contexts.

GS1 General Specification
Provides an overview of all GS1 standards and shows how the different standards relate to one another.

GS1 Architecture Principles
Describes the fundamental principles on which the GS1 architecture is based and helps explain the long-term logic behind the system.

Identity and identification

GTIN Management Standard
Explains when a product needs a new GTIN and how unique product identification is managed in open value chains.

GS1 Identifiers
Provides an overview of the different GS1 identification keys and their areas of application.

Global Trade Item Number (GTIN)
Shows how GTIN is used as a global product identity for trade items.

Global Location Number (GLN)
Explains how companies, functions, locations and facilities can be identified in a shared manner.

GTIN and serialization / EPC Tag Data Standard
Provides more detailed information about serialization and how identity can be used at individual level, not only at model or batch level.

Data carriers and marking

GS1 2D Barcodes
Introduces why 2D codes are becoming increasingly important and how they can be used in more contexts than traditional barcodes.

Data Matrix
Describes the use of Data Matrix, particularly in compact, technical or professional environments.

QR codes
Explains how QR codes are used when several stakeholders need to access information from the same code.

GS1 2D Program
Provides guidance on the transition to 2D codes and how organisations can work with this in practice.

Linking and digital access

GS1 Digital Link
Explains how GS1 identities can be expressed in web addresses and used to connect products to digital information and services.

Digital Link Overview
Provides a more accessible overview of Digital Link and its use as a bridge between the physical product and digital information.

GS1-Conformant Resolver Standard
Describes how identities can be resolved to information and services in a standardised manner.

Data and data models

GS1 Web Vocabulary
Provides support for expressing GS1-related information on the web in a structured and machine-readable manner.

GS1 Global Data Model
Provides a structure for how product data can be organised and expressed consistently.

GDSN
Explains how product information can be shared and synchronised between actors through a shared network.

Information exchange and interoperability

EPCIS
Describes how events connected to products can be shared, for example manufacturing, delivery, receipt, return or recycling.

Core Business Vocabulary
Complements EPCIS by providing shared business terms for how events should be understood and interpreted.

Traceability

GS1 Traceability
Provides guidance on how GS1 standards can be used to build effective traceability throughout the value chain.



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