

A buildingSMART International and GS1 Positioning Paper

# Digitizing construction for better product exchange, identification, and transparency



# Introduction

The growing demand and reliance on digital technologies are changing the way the world lives and works. The rapid advancements in technologies and large volumes of data being produced are providing new opportunities for cross-collaboration between industry actors and are enabling new ecosystems to emerge. New ecosystems offer alignment, business opportunities, and benefits for many industries. The construction industry is set to be one such benefactor. In the construction industry today, widespread inefficiencies and lack of digital adoption are hindering productivity and adding unnecessary waste. This has been well-documented and efforts are underway to tackle these challenges. With the rising potential of what “digital” can offer, and what it means, industry bodies are combining forces to tackle challenges today by better connecting the virtual world to physical assets.

Many industries are adopting global terms such *Digital Twins* or *Industry 4.0* – these are adding new dimensions to how data is collected, managed, and optimized. New business models, improved processes, and more efficient ways of working are becoming an expected outcome. These terms are driving a new generation of thinking – providing new opportunities to boost productivity, reduce waste and add new layers of transparency through entire digital supply chains. With a heightened focus on the need for sustainable practices, and the new EU Green deal promising to “boost the efficient use of resources by moving to a clean, circular economy and to restore biodiversity and cut pollution” [1], the time to act is now.

In a fragmented industry with uncertainty prevalent, both buildingSMART International (bSI) and GS1 are working together to digitalize the construction industry to find integrated workflows across boundaries covering the whole lifecycle of the built asset industry. By combining efforts and expertise, bSI and GS1 aim to provide a digital supply chain by combining openBIM® processes with the identification of products and assets, parties, logistics units, and more. The goal is to accelerate updates in digital technologies, gain more transparency throughout the entire construction supply chain, and to better identify products and services with tangible outcomes. By utilizing Global Trade Item Number (GTIN) identifiers to unlock the GS1 system of standards, and openBIM data, the industry is set to benefit from these combined efforts.

# Background

bSI is the go-to place for open digital solutions and standards for the built asset industry. GS1 standards for identification are open, globally unique, interoperable, and persistent. Based on ISO standards, they are the most widely used standards in many sectors including Consumer Packaged Goods, Transport and Logistics, Healthcare and DIY.

In 2018, bSI and GS1 signed a Memorandum of Understanding (MoU) at the buildingSMART International Standards Summit in Tokyo, Japan with the intention of “advancing standards in the construction industry” [2]. The benefits of open standards-based interoperability throughout the building and infrastructure value chain and lifecycle, and the broader application of digital product information was the driving factor behind the close relationship. In 2019, bSI and GS1 formed a strategic working group to better understand the specific use cases needed to develop a digital supply chain. The working group, titled, Digital Supply Chain in Built Environment (DSCiBE) has met on a regular basis since its launch and will continue to work collaboratively on this topic. The group comprises many industry actors, including product manufacturers, construction companies, architects and engineers, building operators, software vendors, and consultants.





# The problem

The construction industry is in the midst of a digital transformation. Following years of poor productivity, high levels of waste, and the demand for a better understanding of the full traceability and impact of the construction process. There is a need for greater visibility and transparency for product data in the construction industry and this is becoming a business imperative that is driving real change. The industry is also more acutely aware of sustainability challenges too. The construction industry is highly fragmented and levels of digital adoption vary. With data in different silos, and vendor lock-in common, end-users have struggled to gain the full value from the tools available. There is also a lack of international standards applied to best practices and workflows are disconnected from one phase to another.

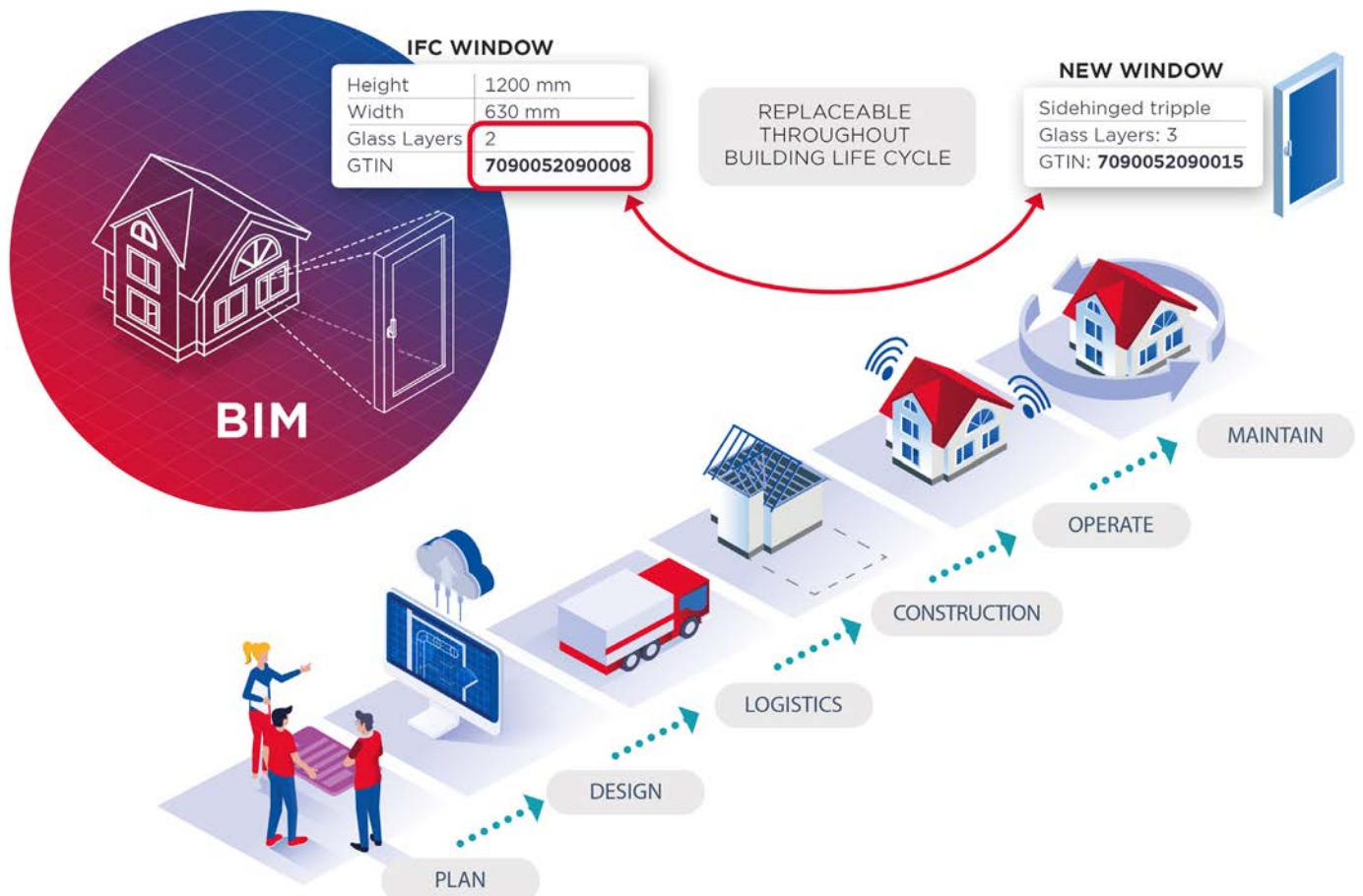
These common themes have been prevalent in the construction industry for many years but there are now new driving forces inflicting the potential for real change. Firstly, there is a need for products in design, construction, handover, and operations and maintenance to be clearly identifiable and traceable. Today, products are not readily available adding to poor productivity, waste, and inefficient processes. Secondly, there is a growing need for connecting the virtual world with the physical world. The emergence of digital twins has offered a new way of working by opening new ecosystems previously not available. New sources of data and information are becoming readily available and the demand for these to be live and useful is high in demand. It is critical to be able to link the physical and digital using interoperable persistent identifiers so that all stakeholders can make use of the rich data available. Operators of assets can leverage the data collected during the design and construction phases to improve the performance of the asset and to ensure that it can be repurposed or recycled in an optimal way at the end of its useful life. Finally, there is a growing demand for a more sustainable environment, shining a lens on industries that produce large volumes of carbon emissions and those that are resource-heavy. Having full knowledge of the carbon footprint of a built asset during the design phase can lead to better material selection decisions – helping to avoid a higher environmental impact and expensive waste management issues later.




**There is a need for greater visibility and transparency for product data in the construction industry and this is becoming a business imperative that is driving real change**

# The mission

GS1 and bSI both provide environments to enhance collaboration and cooperation across borders. The core mission for both organizations is to enable better digital workflows through globally adopted industry standards. Moreover, both organizations are the place to identify use-cases and to drive the work needed. The opportunity to align standards and technologies will provide huge benefits throughout the whole lifecycle of the construction industry. For example, when applied to Industry Foundation Classes (IFC), Global Trade Item Number (GTIN) would provide real opportunities to better understand information and products inside a building or facility.



The background of the page is a dark blue wireframe illustration of a construction site. It features several cranes of varying heights and orientations, and the skeletal structures of buildings under construction. The lines are thin and light blue, creating a technical and digital aesthetic.

Both GS1 and bSI see the imperative to act. There are some real tangible opportunities that have been commonly identified as mission-critical. For example, there is a need to enhance the design process by bringing product manufacturers earlier in the process. System designers for example are typically not part of the design process today, coming in later to the process. If products could easily be identified and made available, designs could be optimized and improved at an earlier stage with greater accuracy and confidence helping to reduce waste, enhance coordination, and more. Moreover, having these products available for site logistics would also add real value to the process. Knowing where a product should go, where products are, and how to apply this to specific assets would allow for a streamlined supply chain. Having this process digitized also provides visibility and transparency to the whole process. For example, this will provide contractors or consultants with a fully transparent and digital workflow to build confidence and trust that the process is documented, reliable, and legally compliant. It may also provide new business models for the industry and offer opportunities for business growth.

The rise in the circular economy and sustainability goals is also a driving factor behind the need to better digital the entire supply chain. Investments in eco-friendly digital tools are critical and the need for innovation will drive the change for reducing carbon emissions and provide the basis for a more visible, transparent, and connected construction workflow. The adoption and promotion of globally recognized standards are key to meeting some of these challenges with demands on industry bodies like bSI and GS1. Adding intelligence to workflows will greatly improve the digital supply chain process, connecting product manufacturers with designers, and bringing control and confidence to owner-operators and facility managers alike will provide real value with some significant use cases already identified.

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# Use Case One

## Sustainable Passports and Logbooks

By 2050, the construction industry will face significant regulatory changes regarding the release, liability, and traceability of products and services.

There are many initiatives being published or developed that will have a significant impact on the whole industry. The European Union (EU) has launched the “EU Green Deal” with the aim to transform its economy into a “modern, resource-efficient and competitive one where there are no net emissions of greenhouse gases in 2050” [3]. The EU Commission considers digital transformation as a key enabler for reaching these Green Deal objectives towards a more sustainable economy. It has been recognized that “digitalisation can also help improve the availability of information on the characteristics of products sold in the EU”. For instance, an “electronic product passport” should be able to provide information on a product’s origin, composition, repair and dismantling possibilities, and end of life handling. For the construction industry, this concept could be applied in different ways. For instance, an “electronic product passport” should be able to provide information on a product’s origin, composition, repair and dismantling possibilities, and end of life handling. For the construction industry, this concept could be applied

in different ways. For instance, all plans, models, and calculations, created during the erection phase, could be compiled in a building passport while all products, services and maintenance operations could be compiled in a building product passport. The use of open GS1 standards for the identification of the passports and all related products, and services would ensure the full traceability of the building’s history, from the cradle to the grave. Moreover, the EU is driving the need for “digital building logbooks” which will address the challenges of data availability in the construction sector and increase transparency, trust, and informed decision-making. These logbooks rely on BIM data as a means to be digital and dynamic and keep records for a variety of reasons. Material passports will achieve maximum benefit when they are incorporated into asset management systems through openBIM workflows, therefore there is a need to achieve a degree of interoperability between GS1 and bSI standards.

# Use Case Two

## Facility Management and Asset Management

Asset management and facilities management are aspects of the built asset industry that have a close relationship. Asset management is industry recognized meaning a systematic process of developing, providing, operating, maintaining, repurposing, upgrading, and disposing of assets in the most cost effective manner, including all costs, risks and performance attributes. In other words asset management is described as an organization's activity to realize value from its assets. Facilities management is known as the "in-use" or operational phase of the built asset industry.

Together they focus on maximizing existing assets and making choices on capital investment by understanding the whole life value and costs associated through optimal decision making and insights based on information available. Facility managers have a range of challenges today, from ensuring compliance and safety to controlling costs to name but a few. Today, one of the biggest challenges is the loss of data during handover. Asset managers have opportunities opening up to them, through digitisation, to link their organisational objectives to the capital and operational functions leading to many benefits through better decision making. This reach will encompass all players in the supply chain, over the whole life of the assets and with ability to focus on the appropriate level of definition from facility to component.

Last year's winner of the buildingSMART Award in the category of "Handover" was Vestfold Hospital, located in Tønsberg, Norway [4]. This project included the demolition of existing old buildings and the construction of new buildings without any reduction in healthcare service throughout. With a ten-year digitization plan, the hospital served as a pilot for the regional health authority and Sykehusbygg (Norwegian Hospital Construction Agency) to establish an openBIM Facilities Management (FM) solution to ensure a smooth handover, clear information ownership, and data longevity. The FM solution that was developed during the project was based on IFC4.0 and connects BIM objects directly to information about the objects and building systems. To do this, a new and efficient openBIM-based method was developed to gather and deliver FM information. The supply chain information from

the main contractor (Skanska) and sub-contractors was forwarded to an external product information database (CoBuilder). The information/documentation about the delivered products was automatically extracted from CoBuilder by Jotne BIM server and established as a commercial product database within the Jotne Catalog BIM server. The solution uses GTINs as the primary key to upload product information and documents from the CoBuilder product portal. From the BIM server, all extracted information is then automatically connected to the BIM objects in the IFC model with the corresponding GTIN. The project is on schedule and on budget, including a near 10% cost reduction compared to a project that was completed in 2005. Not only has it acted as a model use case, but this hospital project showed the true value of using buildingSMART standards and solutions and standards from GS1.



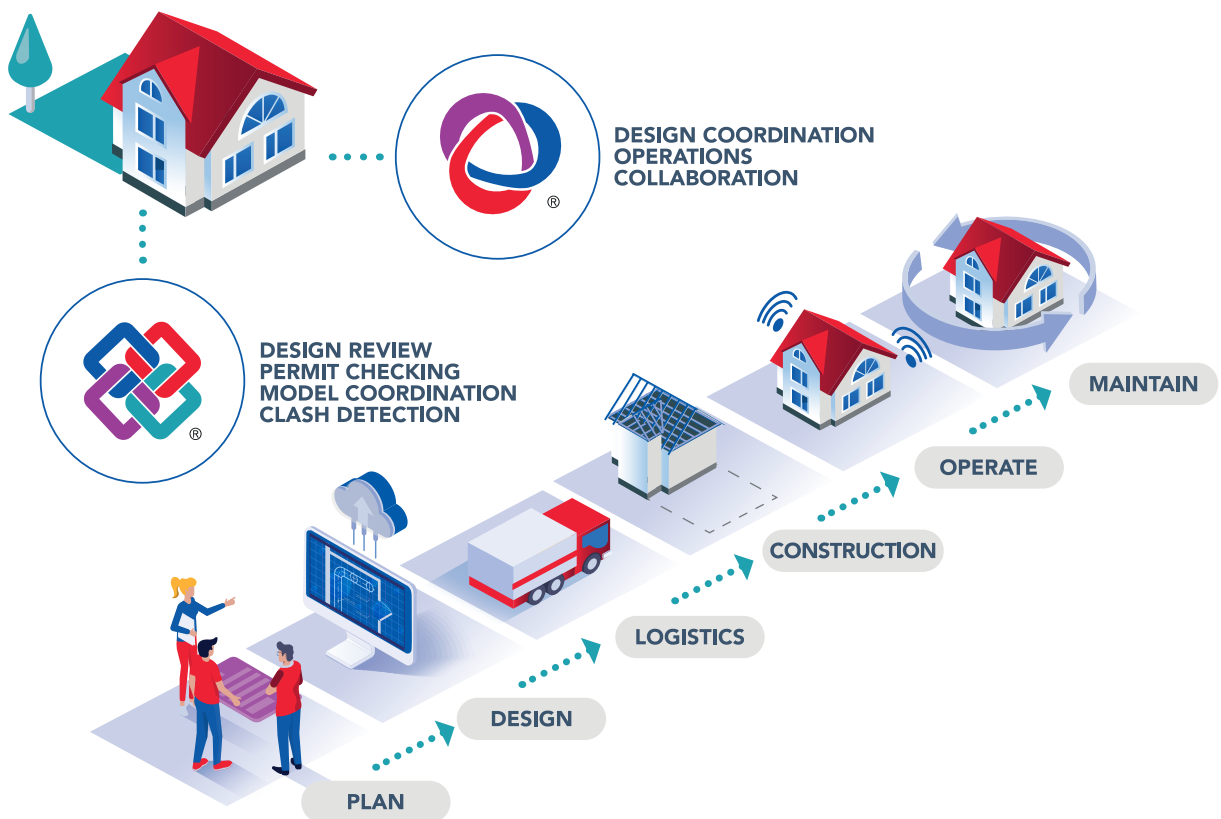
# Use Case Three

## Design to Order

This Proof of Concept (PoC) project is addressing a major use case and industry challenge today – the concept of design to order.

In order to describe the properties of a construction product in a structured and sustainable manner from the design to order phase, both the requirements of the Declaration of Performance (DoP) and the Environmental Product Declarations (EPD) need to be met. The former is expressed by CE Marking according to the Construction Products Regulation (CPR). Both declarations help minimize CO2 footprint and connect the product to as-built physical construction products, allowing ordering and full traceability throughout the entire lifecycle. This industry-driven PoC addresses the above-stated problem using EPDs, DoP including the buildingSMART Data Dictionary and Data Templates to connect to GS1 identification keys allowing

AIDC technologies (Auto Identification and Data Capture). Moreover, the PoC also includes a practical implementation of GS1 GMN (Global Model Number) and the mapping to different classifications systems for generic product types. This approach is likely to strengthen how the practical structure of customer-defined GTIN and GMN can be used to facilitate the mapping from generic products to specific products. This PoC brought together stakeholders including manufacturers, contractors, industry organizations, environmental research and assessment bodies, BIM Alliance Sweden (bSI Swedish Chapter), The National Agency for Public Procurement, and GS1.



*IFC and BCF help with design review and model coordination*

# Use Case Four

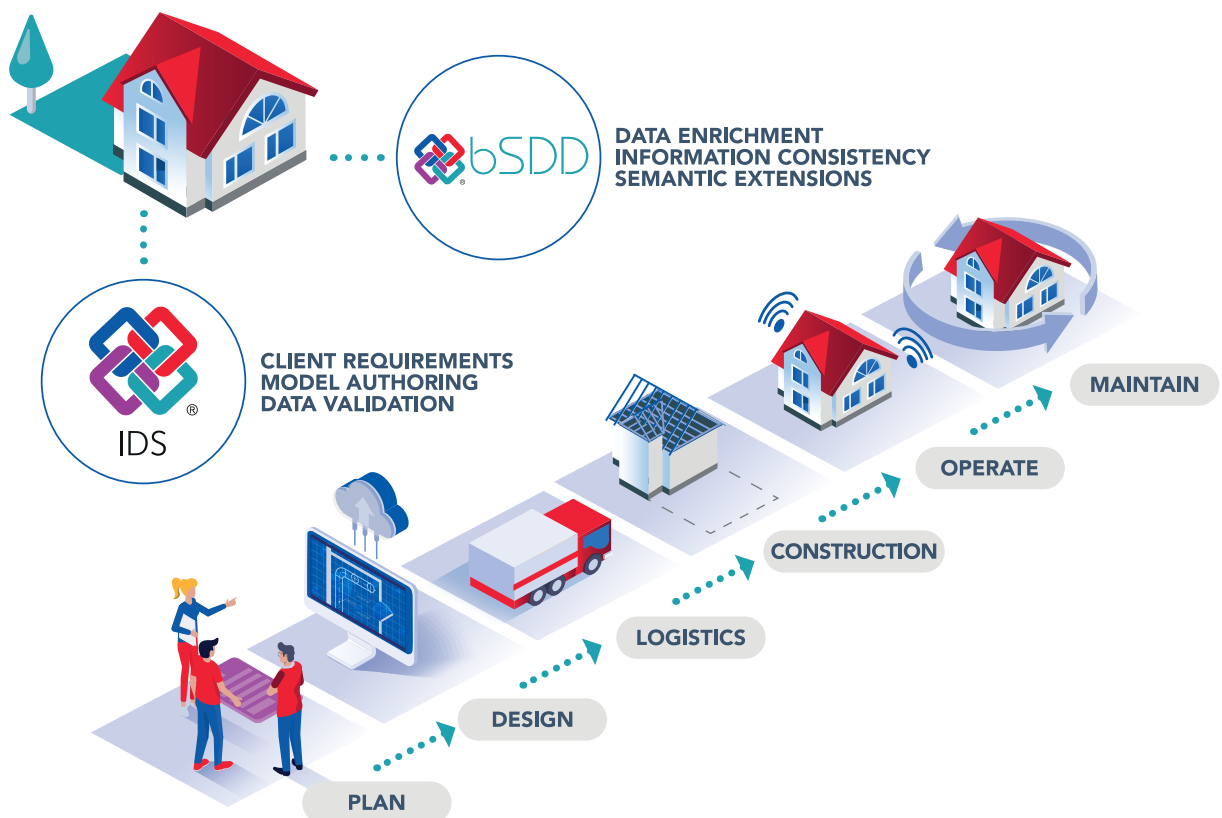
## Logistics and Data Templates

There is a growing need for digitization of logistics and the connected supply chain to better define terms and types related to products and materials.

Organizations require structured data that describes the characteristics of an object as a methodology to connect to other digital workflows. By structuring and standardizing terms and types, the industry will have a more connected and common ecosystem that utilizes digital technologies to enhance and streamline logistics workflows. Delivering the correct products and sub-assemblies to construction sites on an as required basis with 'just enough resources' will allow the construction to take place efficiently. The objective is to achieve 'flow' on site, and the rate of construction to trigger the

demand to supply. Achieving this requires a combination of several use cases including the three previous ones in this paper.

One such opportunity could be to develop product data templates that map to the bSDD that includes unique codes and identifiers such as GTINs to provide the overall framework for a common language. This baseline language will support a variety of use-cases and ensure better logistics for construction.



*Clients help define industry requirements*

# Future Benefits

With these four use cases, buildingSMART and GS1 see a real industry need to address them with action. With growing topics like digital transformation, digital twins, and sustainability becoming more relevant, both organizations are accelerating the use and adoption of standards and solutions available with industry-leading partners and thought-leaders. Both organizations are calling on industry actors to contribute to the development of standardized workflows and to further develop more use cases.

By connecting openBIM data and processes with GS1's GTIN and GMN's, there is a clear opportunity to make the whole construction process more transparent, predictable and productive. This paper is the first part of a series of documents to outline the use cases and opportunities to connect and collaborate. There will be further iterations and more focused papers in the future. Both bSI and GS1 will continue to focus the working group on real use cases and tangible output.

**There is a clear opportunity to make the whole construction process more transparent, predictable and productive**

## About GS1

GS1 believes in the power of standards to transform the way we work and live - and is a neutral, not-for-profit, user-driven and governed organisation that develops and maintains the most widely used global standards for efficient business communication. It is best known for the barcode, named by the BBC as one of "the 50 things that made the world economy". GS1 standards improve the efficiency, safety and visibility of supply chains and item life cycles across physical and digital channels in 25 sectors. Its longevity, scale and reach help ensure that GS1 standards create a common language that supports systems and processes across the globe. Since its establishment in 1971, the organisation has grown to include local Member Organisations in 115 countries, 2 million company members and 6 billion transactions every day. Find out more at [www.gs1.org](http://www.gs1.org).

## About buildingSMART International

buildingSMART International (bSI) is the go-to place for developing open digital solutions and standards for the built asset industry. bSI is driving digital transformation for the building and infrastructure industries and aligning the industry to common goals. bSI is committed to delivering digital ways of working by the creation and adoption of open, international standards and solutions. At its core, buildingSMART believes in cooperation, collaboration and innovation and has been leading the way on key topics. bSI believes the process of digital transformation in the built asset industry affects everyone. It is not limited to a few actors to shape the change required. On the contrary: no one player can set the direction and speed of innovation. The interdependencies for everybody in the PBO-I lifecycle, spanning countries, cities, government authorities, asset owners, building project participants (designers, engineers and contractors), operators, standard-setting bodies, and citizens are complex. Key to this interplay is standardisation as well as simplification. This approach has been proven successful in many other industries and it needs to be applied to the built asset industry.

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## Sources

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[2] <https://www.buildingsmart.org/buildingsmart-and-gs1-signed-a-memorandum-of-understanding-to-advance-global-standards-in-the-construction-sector/>

[3] <https://www.gs1.eu/news/circular-data-for-a-circular-economy>

[4] <https://www.flipsnack.com/buildingSMART/the-bsi-awards-brochure-2020/full-view.html?p=22>

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