

White paper NACO Data Dictionary



Authors	Gerard van der Veer and Mike dos Santos Freitas
Date	February 2026
Version	1.0

Abstract

This white paper presents NACO's journey towards implementing a Data Dictionary for airport projects, aiming to enable standardised data exchange across airport design, construction, and operations. This paper highlights how structured data enhances collaboration, design quality, and efficiency, as well as client operations. Internally at NACO and Haskoning, this development fosters consistency, transparency, and improved workflows; externally, it strengthens interoperability with stakeholders, supports regulatory alignment, and elevates the value of deliverables throughout the asset's lifecycle.



Changing market and the need for digitalisation

The construction sector has undergone significant changes in recent years. Not only has the way we build evolved, but also our daily engineering practices have become highly digitised. Information exchange between parties has become more complex; there is a constant need for increased efficiency, and there is an increasing focus on how data is structured, transferred, and utilised. This calls for a fundamental revision of our processes, placing data at the core.

Improving our processes, making them faster, better, and more engaging—requires a deep and clear understanding of how our data is structured: which attributes are defined, how data is named, where it is stored, and how it is shared. Standardisation of data is a key concept in our digital transformation into a truly data-driven way of working.

What is a Data Dictionary?

A Data Dictionary structures information e.g. of assets or functions.

A Data Dictionary is a catalogue or repository that defines:

- The names of data elements.
- Their descriptions (what they represent).
- The format/units (e.g., text, number, length in meters).
- The allowed values or constraints.
- The relationships between elements.

Purpose

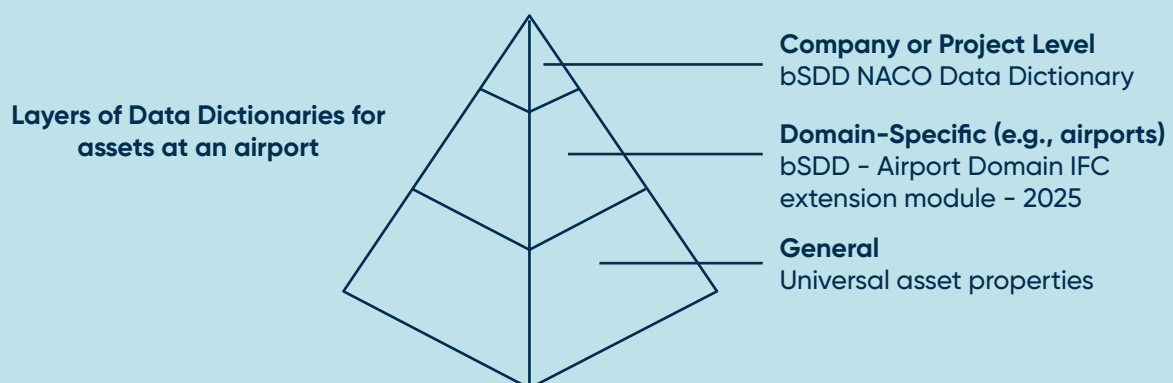
- Ensures consistent understanding of data across different teams and software.
- Provides a common language for designers, engineers, and clients.
- Helps with data validation (checking that data follows the rules).
- Makes it easier to exchange data between systems (interoperability and machine-interoperability).

The concept of a Data Dictionary was adopted by buildingSMART and serves as the foundation for standardised information exchange in the construction sector. Data Dictionaries are data blueprints (classifications, ontologies) that are stored and shared on an open platform. These blueprints can be used and modified by the Data Dictionary owners, with a history of changes being tracked.

To describe an airport, NACO adopted the following layered approach for information standards:

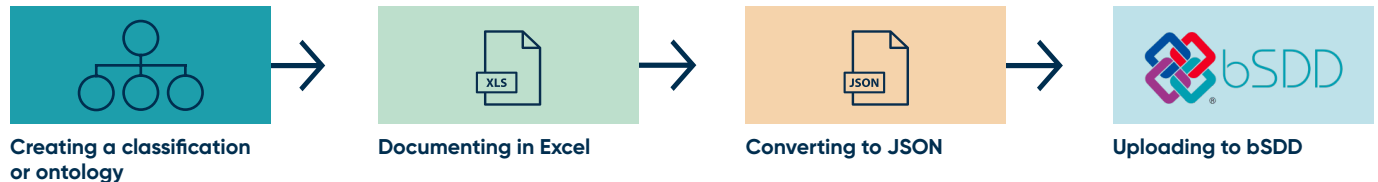
1. Generally applied and defined element information (IFC - ISO 16739-1:2024) – (bSDD-IFC-schema 4.3) information definition for universal asset properties
2. Domain-specific (e.g. airports) – (bSDD – Airport Domain IFC extension module – 2025) information definition for specialised objects such as baggage handling systems, control towers, and civil infrastructure
3. Company or project level (bSDD- NACO Data Dictionary) – information definition for internal classifications and project-specific definitions of assets or functions

Additionally, multiple Data Dictionaries can be combined on projects to meet specific project needs. A unique feature of the Data Dictionary is to work language independently and therefore its ability to act as a translator by using a machine interpretable unique code that links naming and descriptions of multiple languages. Classification systems like NL-SfB or UniClass can also function as a Data Dictionary. This allows for country- or project-specific classifications, such as SZW in Sweden.



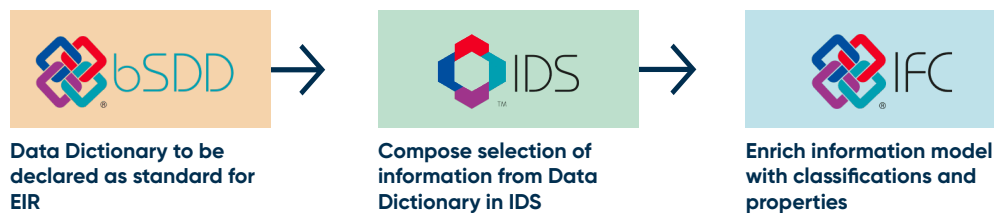
Technical Methodology

A workflow has been developed to standardise set up and usage for a Data Dictionary. It consists of a set up procedure and a usage procedure.



Procedure of Data Dictionary set up:

1. Creating a classification or ontology – for example, based on regulatory frameworks
2. Documenting in Excel – a format accessible to all stakeholders
3. Converting to JSON
4. Uploading to the buildingSMART platform – enabling broad accessibility of the data



Procedure for Data Dictionary usage:

1. Record the data dictionary in the exchange information requirements.
2. Select which parts of the data dictionary apply to the project and use this to create an IDS (Information Delivery Specification).
3. Enrich project information model with bSDD (classifications, entities, properties and relations) by connecting model authoring software with platform.

**) IDS – Information Delivery Specification – is a structured way to define exactly what information is required in a digital building model. It tells project teams what data is needed, for which elements, and at what stage, using clear and machine-readable rules. This helps ensure that everyone delivers consistent, high-quality information, and that digital models can be checked automatically to verify they meet the requirements.*

This method enables the creation of Data Dictionaries that can be used across various software environments. An in-house developed tool plays a central role in this process: it allows standardised properties to be added to objects in design software such as Revit and Civil 3D.

Application in asset life cycle

The Data Dictionary is developed for structured information exchange across all phases of the asset life cycle:



1. Initiation and definition phase.

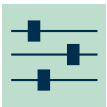
In this phase, clients define requirements for their assets both in development and usage. The Data Dictionary can function as a structured reference framework that ensures consistency, clarity, completeness and interoperability across all stakeholders by standardising terminology, data attributes, and expected values throughout the asset lifecycle.



3. Operation and maintenance phase

Standardised and structured data (information) per asset can be used for operational and maintenance purposes.

The shared and enriched information from earlier development stages form the basis for decision making and usage in the operational and maintenance stage. This improves the quality of the data for its intended purpose, for example when it is used in a digital twin software platform.



2. Design and construction phase

- a. Planning and strategy – Functions and their information requirements (semantics, parameters and internal relation) are summarised and standardised based on regulations from e.g. ICAO, IATA, and others regulatory bodies. This enables the development of master plans that are faster and more consistent. Elements like colour coding and information requirements can also be standardised per project or organisation.
- b. Design and construction stages – Assets in digital models automatically receive standard information (properties) based on a shared Data Dictionary. For example, when a door object is placed in a model, parameters from the Data Dictionary – in fixed units and formats – are added. This results in faster workflows and improved quality.

Data Dictionary Value



Value for clients

Our clients receive BIM models filled with data. By using Data Dictionaries and an IDS, they can:

- Decide for themselves which information they want to receive
- Have that information validated automatically
- Understand the format of the data they receive
- Map the data to fit their in-house applications
- Gain full insight into their asset's properties and lifecycle data
- Make informed decisions about design, management, and maintenance

For example, a client requests doors. The architect proposes wooden doors. Using the door data, the client can in this case assess with lifecycle analysis applications whether this is a good choice in terms of maintenance and usage. This creates a link between design, requirements, and operational processes.

Clients can also create their own Data Dictionaries and use an IDS to verify whether the delivered information meets their standards. This enables them to ensure that the data they receive can be integrated with other software or apps—such as linking Maximo to a Digital Twin.



Value for engineering and consultancy management (e.g. NACO)

For engineering and consultancy management, the Data Dictionary methodology offers:

- Optimisation of internal processes – faster, more efficient, with more satisfied employees
- Commercial advantages – competitive edge through improved efficiency and quality
- Expansion of services – new offerings such as providing maintenance data via Digital Twins
- Strategic positioning – our firm as a central player in asset management services

Engineering firms like Haskoning can take on a more central role during the asset lifecycle, particularly in design, operational and maintenance stages, due to their independent position in the process. They can control the data in BIM models, increasing the added value of the engineering firm.



Value for engineering and consultancy colleagues

For colleagues, such as architects, engineers, modelers and project managers this means:

- Greater responsibility – they can manage and validate data independently using IDS.
- Less repetitive work – thanks to automated checks and data entries.
- More enjoyable work – with increased focus on content and creativity.

Mind-numbing tasks like manual data entries, verifications, and validation can be automated. The basis for this is a clear agreement in information starting points on how data is delivered and recorded. The Data Dictionary plays a crucial role in enabling this process.

Reflection and philosophical perspective

The shift towards data-driven work brings not only technical innovation but also organisational and philosophical implications:

- New roles are emerging—such as information managers and data engineers.
- Education and management must evolve—with greater emphasis on data, digitalisation, and collaboration.
- Organisations are adopting less hierarchical structures – placing more responsibility at the operational level. The advancement of digital tools gives rise to a concerning trend: as automation increases, essential knowledge gradually evaporates. Users become more dependent on software, diminishing their capacity for manual calculation and their grasp of visual fundamentals such as shading in real-time rendering and visualisation software.
- On a deeper level: how does an expert stay connected to their field in a world where work becomes increasingly abstract and automated? At times, the abstraction makes the work feel like a video game. Everything becomes comparable, and tools become universal. What does this mean for the role of advisors?

Conclusion

The implementation of a Data Dictionary marks a pivotal step toward a more intelligent, collaborative, and future-ready construction industry and way of working. By standardising data across disciplines and project phases, this approach enhances design quality, operational efficiency, and lifecycle asset management. Beyond technical gains, this shift empowers professionals, reshapes organisational

roles, and opens new possibilities for clients and stakeholders. As digitalisation continues to redefine infrastructure and engineering, embracing structured data offers practical benefits and helps organisations stay adaptable in an ever-evolving landscape.

Biography

This white paper was prepared by Mike dos Santos Freitas and Gerard van der Veer. Both work at NACO, Netherlands Airport Consultants, a company of Haskoning, and are members of the steering committee of AirportDomain at buildingSMART International. Mike works as a BIM and Information Manager and, in that capacity, has been part of project teams for airport design for 23 years. Gerard has been an airport architect since 1992 and is responsible for the digital development at NACO. The further development and dissemination of digital ways of working within the entire asset industry—particularly in the airport sector—is their motivation for writing this whitepaper.



Mike dos Santos

mike.dossantosfreitas@naco.haskoning.com



Gerard van der Veer

gerard.vanderveer@naco.haskoning.com

About NACO

NACO, Netherlands Airport Consultants, a company of Haskoning, is a world-leading airport consultancy and engineering firm with over 75 years' experience in creating future-ready airports and spearheading the next generation of aviation. From major landmark design and regional airport hubs to world-class customer experience and sustainable aviation, we harness the skills and expertise across our multidisciplinary team to shape the future of aviation.

Contact us

Contact us by visiting our website
or get in touch with our experts:

in [linkedin.com/company/naco-netherlands](https://www.linkedin.com/company/naco-netherlands)
 info@naco.haskoning.com

