HANDBOOK FOR THE INTRODUCTION OF BUILDING INFORMATION MODELLING BY THE EUROPEAN PUBLIC SECTOR

STRATEGIC ACTION FOR CONSTRUCTION SECTOR PERFORMANCE: DRIVING VALUE, INNOVATION AND GROWTH

2 General Guidance

3 Action Recommendations

Who is this handbook aimed at?

Public Policy User

National Or Local Public Client/ Procurer User

Operator User

	BUILT ASSETS		SECTORS	
	Delivery Phase	Use Phase	Construction	Digital
ECONOMIC	10% savings on time delivery ●●●●	Lower maintenance costs Lower operations costs ●●●●	Improve sector competitiveness Grow export capability ●●	Grow digital services industry Digital single market
ENVIRONMENTAL	Less site waste	Optimise operational energy use Assess whole life-cycle analysis ●	Resource efficiency Circular economy ●	Data infrastructure resource efficiency
SOCIAL	Higher standard of health and safety Improved public consultation and engagement	Improce social outcomes (e.g. patient care, pupil learning) ●	Cleaner and safer jobs in construction Attract next generation to the sector	Data Security Attract digital talent to construction

Reason for leadership	Description of the driver
Better value for public money	The public sector procurer has responsibility to gain the most economically advantageous value for public money. The introduction of BIM can offer more accurate and lower construction costs, and the reduction of delays for project delivery of public built assets.
Public procurement as a motivator for innovation	Governments, as the single largest procurers of construction with public sector spending approximately 30% of construction total output, can influence and encourage innovation. This is one of the stated aims for the European Union Public Procurement Directive (2014).
Network effect of adoption: support for SMEs	As the construction industry is highly fragmented with 95% of the industry defined as Small to medium sized Enterprises (SMEs), it is not easily able to organise itself and align on one single direction. Only through the wider adoption of BIM across the value chain will full economic benefits be achieved.
Digitalisation agenda	Governments, policy makers and industry are recognising the benefits of encouraging the digitalisation of industrial sectors. This is an especially important agenda in Europe with the European Commission's Digital Single Market initiative.

Benefit of a European approach	Description of the benefit
Accelerate national efforts	Through collaborative working and sharing of best practice, nations can accelerate their own BIM initiatives by learning from others.
Minimise costs	Wasted effort and investment can be minimised through the reuse of existing developments and knowledge.
Impactful and robust programmes	By drawing upon existing knowledge and practical experience of what makes programmes successful, individual nations can be informed to create and implement effective initiatives.
International critical mass	Taking a similar approach to neighbouring countries for the encouragement of BIM will increase the strength and effectiveness of each individual national programme.
Reducing trade barriers to growth	Alignment of a European approach will encourage trade and opportunity for growth across borders. Creating national specific approaches will likely confuse the construction sector, discourage cross border working and add a cost burden to the industry when complying with national different approaches.
Encourage international standards developments and software integration	Europe has the opportunity to collectively encourage the development of standards for use in international markets. This ensures open competition in the supply chain and the open sharing of information across software platforms.

Strategic framework for public sector BIM programmes

Grow industry capacity

Early wins, pilot projects, training
Increasing use of strategic lever to grow capacity
Measure and monitor, case studies, embed change

Communicate vision and foster communities

Engage industry stakeholders
Create regional and focus networks
Events, media, web, social media

Build a common, collaborative framework

Legal and regulatory framework
Data and process standards
Skills, tools, guidance

Foundation of public leadership

Compelling drivers, visions and goals
Aligned value proposition and strategy
Sponsor, funded programme, stewardship team

Strategic Area	Action high level description
Public leadership	■ Define compelling drivers, a clear vision and goals ■ Describe the value of BIM to the public and private sector ■ Document the general approach for moving the industry towards the defined vision and goals ■ Identify a public sector champion to sponsor the initiative ■ Establish an implementation team to drive the programme. The value proposition and sponsor can unlock the required funding and resources
Communication and communities	■ Early and frequent engagement with industry stakeholders is essential to support the industry change process ■ Participate in and provide encouragement for regional and special interest networks to disseminate best practice ■ Use mass communication tools, such as online media, events, web and social media to reach audiences
Collaborative framework	■ Assess and address legal, regulatory, procurement and policy barriers in order to facilitate collaborative working and sharing of data. ■ Develop or use international standards for data requirements ■ Reference international standards for encouraging collaborative processes and sharing of data ■ Produce guidance and tools to support the upskilling of industry and development of academic curricula
Capability and capacity development	■ Run pilot projects and promote training to encourage early successes. ■ Increase the use of public procurement as a driver for industry capacity development ■ Measure progress, produce case studies to increase industry awareness and support

Common EU performance level for the implementation of BIM

Definition Area	Characteristics high level description
Policy	■ Commercial, legal and contractual matters are agreed and documented in an appropriate format and become part of the contractual arrangements between the parties involved. ■ The tender process includes an appropriate assessment of the supplier's capability, capacity and willingness to deliver the BIM requirements. ■ Information requirements associated with a construction project are specified and expressed in terms of the project stages that the project client or the supply chain intends to use. The fundamental principle of avoiding over-generation and over-processing of data should be applied through the specified information requirements. ■ Details on how the information requirements will be met and delivered are agreed and documented in an appropriate format.
Technical	■ The information requirements specify data to be provided in vendor-neutral, non-proprietary formats. ■ An object-oriented approach forms the basic principle of specifying, modelling and organising data
Process	■ The information planning and delivery processes require container-based and collaborative working principles. ■ A Common Data Environment (CDE) is required as a means of providing a secure and collaborative environment for sharing work. ■ System engineering tools and methods are required to encompass holistically all needs and requirements of all stakeholders in a comprehensive manner covering all architectural visions – operational, functional, organic – for all states of the built assets along its lifecycle, and to structure properly all information.
People	■ Responsibility for data and information management is assigned in accordance with the complexity of the project.

What are the recommendations?

	Highly recommended	Recommended	Encouraged
Vision, Drivers & Goals	Ensure clear public drivers and goals are defined and documented. Make a public statement of intent.	During the BIM adoption process, change management strategies should be implemented to support and monitor commitment, to detect problems or inefficiencies, and where needed to take corrective actions.	Define organisational level metrics that address the drivers and describe progress towards the goals. Benchmark the starting point and measure progress throughout.

What are the recommendations?

	Highly recommended	Recommended
Value proposition & Strategy	Define clear value proposition and strategy for introduction of BIM. Use public sector procurement as a lever for the introduction of the programme. Adopt the strategic framework and performance level introduced in this document.	Should consider phased roadmap development for progressive introduction of BIM to public works. Should provide a definition for BIM. Ideally refer to a set of levels or modules that require a level of performance.

Roadmap Germany

What are the recommendations?

	Highly recommended	Recommended	Encouraged
Sponsor, funding and stewardship team.	The introduction of BIM to the public estate or as a policy requires resources and a plan. Therefore there must be funding for a defined program and an executive team with sufficient experience to implement the program.	Should provide a visible public sponsor (i.e. the individuals that are ultimately responsible for the program). Ensure that all parts of the industry are engaged in the program.	Could consider a public and private initiative for funding and a joint program. Encourage alignment with EU funded programmes and make use of available funding

What are the recommendations?

	Highly recommended
Engage early with industry (formal networks and institutes)	It is highly recommended that owners of BIM programs proactively communicate the public vision, drivers and goals for the introduction and the implementation of the road map of BIM.

What are the recommendations?

	Highly recommended	Recommended	Encouraged
Create networks (cross-country and cross-discipline)	It is highly recommended to join established international and national networks both to contribute in the development of BIM, and for transfer of know-how. It is also highly recommended to create networks between public stakeholders/clients, if lacking, to align strategies, goals and the legal and regulatory framework.	Should identify potential collaboration with other countries to support and encourage alignment of common practices.	The public sector program could create, encourage or participate in networks of industry supply chain members, including technology providers, clients and academia. This facilitates best practice sharing across the country and across disciplines. These special interest groups may be small in size, e.g. 20–30 stakeholders. However they are vital for disseminating good practice across the value chain, and especially SMEs.

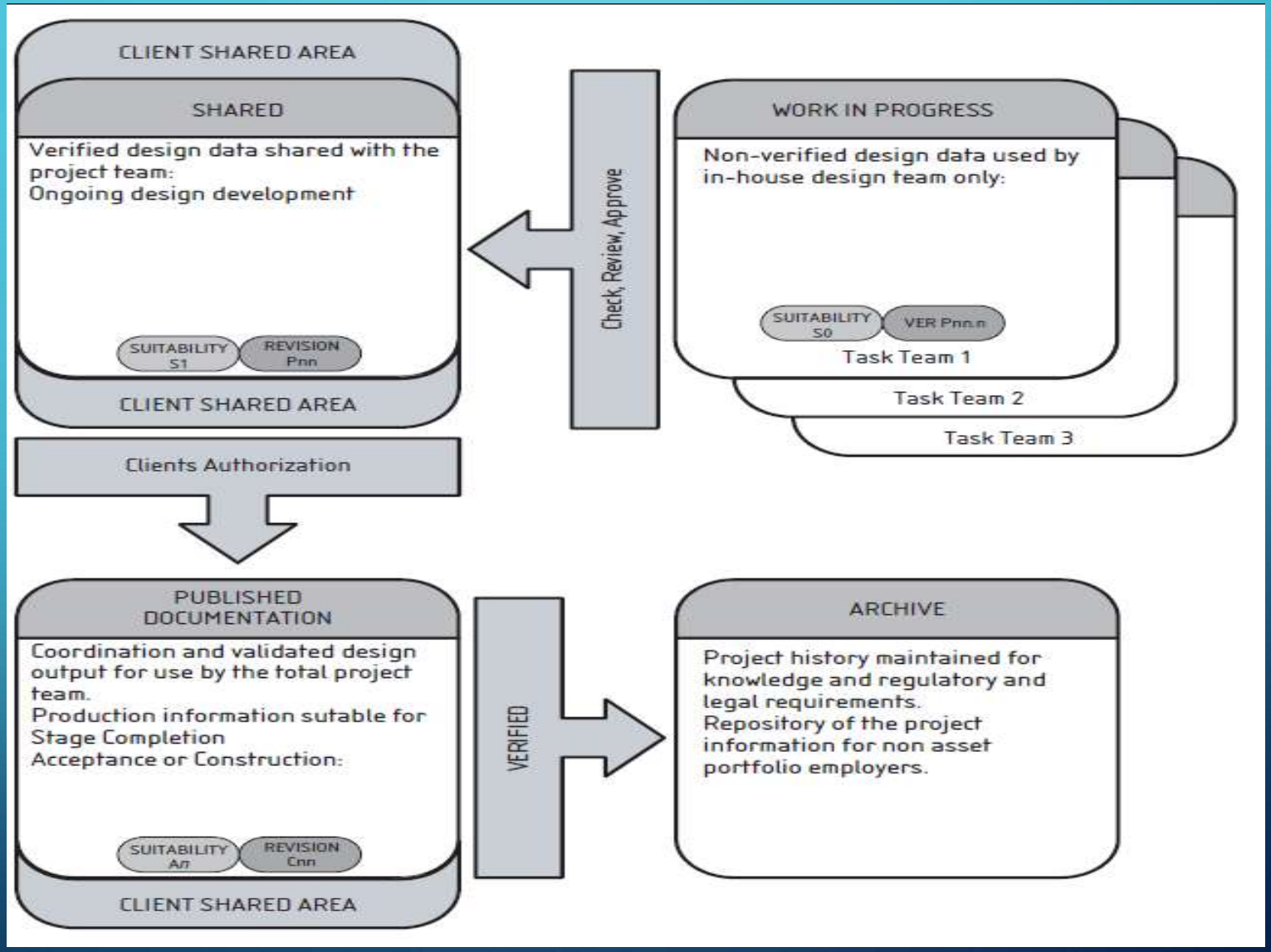
What are the recommendations?

	Highly recommended
Mass communication via events, media, web and social media	Should leverage mass communication tools to raise awareness of the program to the maximum audience. Define, recognise and encourage best practice of BIM implementation.

What are the recommendations?

	Highly recommended	Recommended	Encouraged
Legal and regulatory framework	Assess the legal and regulatory support needed for the introduction of collaborative BIM. Identify gaps and remove barriers for the use of digital data in relation to liability, ownership and rights that constrain benefits resulting from the wider adoption of BIM. Ensure open access to trade.	Align legal and regulatory framework with EU policies and legislation.	Could influence policy and regulations development at a higher level, e.g. EU.

PAS 1192-2


CLIENT SHARED AREA
SHARED
Verified design data shared with the project team:
Ongoing design development
SUITABILITY S1
REVISION Pnn
CLIENT SHARED AREA
Clients Authorization
Check, Review, Approve
WORK IN PROGRESS
Non-verified design data used by in-house design team only:
SUITABILITY S0
VER Pnn.n
Task Team 1
Task Team 2
Task Team 3
PUBLISHED DOCUMENTATION
Coordination and validated design output for use by the total project team.
Production information sutable for Stage Completion
Acceptance or Construction:
SUITABILITY A/1
REVISION Cnn
CLIENT SHARED AREA
VERIFIED
ARCHIVE
Project history maintained for knowledge and regulatory and legal requirements.
Repository of the project information for non asset portfolio employers.

- guidance for collating, managing and sharing information
- managing different model versions in a file based workflow
- a security minded approach to BIM
- a central repository of BIM files for controlling access to information

	Highly recommended	Recommended	Encouraged
Technical: a and process standards	Require the use of a technical framework for data and process. Ensure that technical frameworks support open access to trade.	Should use ISO or CEN standards for data classification, exchange, security and processes. Don't invent own standards.	Participate in the development of national, European and international standards.

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Netherlands, Rijkswaterstaat

Framework / Performance Criteria: Build a common collaborative framework
Topic: Technical: data and process standards
Recommendation: Require the use of a technical framework for data and process (preferably ISO or CEN standards) and participate in the development of these standards. Ensure that technical framework support open access to trade.

CONTEXT

Rijkswaterstaat provides in more than 20 infrastructure contracts an Information Delivery Specification (IDS) which is part of the contract. The IDS describes the process of the delivery of the data, the frequency of delivery, the responsibilities of the contractual partners, the use of open standards and how to exchange data.

WHY WAS IT DONE AS DESCRIBED?

The application of open standards provides all parties with a level playing field which is important to a public authority to ensure open competition and non-discrimination.

Contractual parties have to be clear about the process of data delivery, the frequency, etc. Hence a generic open framework was applied in combination with an open standard in order to record the decision and the decision making process followed.

WHAT LESSONS CAN BE LEARNED?

The contractual partners work along the same procedure, which clarifies the process right from the beginning. Although some IT companies build in this kind of open standards in their software products more companies need to do this in order to make use of software functionality available on the market.

FURTHER INFORMATION:

- http://www.iso.org/iso/catalogue_detail.htm?csnumber=55691

France PTNB

Framework / Performance Criteria: Build a common collaborative framework
Topic: Technical: data and process standards
Recommendation: Participate in the development of national, European and international standards.

The work identified thirteen topics of standardization work in connection with BIM and on which French players are invited to position themselves. To offer an integrated vision, four main families of subjects were defined:

1. BIM management or the sharing of information between actors (Information Delivery Manual, BIM Execution Plan, ISO 19-650).

2. BIM modelling or the machine to machine communication (Industrial Foundation Classes [IFC], BIM Collaboration Format [BCF], Model View Definition [MVD]).

3. BIM Model with dictionaries, classifications and BIM objects (Product life cycle support [PLCS], experimental standard XP P07–150).

4. Cross-cutting topics, such as data containers (which allows structured delivery of heterogeneous information) or "Linked data" (which links all documents associated with a known project).

5. All these standards are to be linked to other environment related topics, such as Smart City and Transport Infrastructures.

BIM Learning Outcomes Framework

	Recommended	Encouraged
Skills development and guidance	Should provide framework for skills development.	Provide guidance for the understanding of the framework implementation.

1. Understand what BIM is, the contextual requirement for BIM Level 2 and its connection to the Government Construction Strategy and Industrial Strategy 2025; including an understanding of:	
1.01	Background and the need for collaborative working (removing waste, errors and poor quality/in-complete information)
1.02	The value of whole life and whole estate approach rather than capital-led and single asset
1.03	The concept of Soft Landings / Government Soft Landings (GSL)
1.04	Roles and responsibilities of the supply chain members and clients as part of BIM Level 2 delivery (cultural / behavioural)
1.05	External context for BIM, global, national, standards and support communities
1.06	Core and extended suite of standards, documents and deliverables describing BIM Level 2
1.07	Barriers to successful adoption of BIM Level 2 and how to create the conditions for success
1.08	The value of high quality data and the principles of data management
1.09	The key vulnerability issues and nature of controls required to enable the trustworthiness and security of digitally built assets

BIM Learning Outcomes Framework

2. Understand the implications and value proposition of BIM within your organisation; including an understanding of:	
2.01	Implementation implications for the introduction of BIM Level 2 on your organisation and supply chain (e.g. training, management processes and systems)
2.02	Organisational change management considerations in context of the introduction of BIM Level 2
2.03	Assessment of capability of your organisation and your supply chain (e.g. standard methods of assessment PAS91 Table 8)
2.04	Technical, technology and interoperability requirements of Level 2 BIM (Information Management / CDE, model-based design and analysis)
2.05	The importance of Level 2 BIM as a driver for business process review and improvement
2.06	Legal and commercial implementation implications for the introduction of BIM Level 2 on your organisation and supply chain (e.g. commercial stakeholders)
2.07	The value, benefits and investment associated with BIM Level 2
2.08	How BIM supports the relationship between Design & Construction and Facilities & Asset Management
2.09	The potential security threats to built and information assets, and the need for the development of an appropriate and proportionate security risk management approach

BIM Learning Outcomes Framework

3. Understand the requirement for the management and exchange of information between supply chain members and clients as described in the 1192 suite of standards and PAS55 / ISO 55000; including an understanding of:	
3.01	The purposes for information in the capital and asset phase
3.02	Requirements for the exchange of information between supply chain members in a collaborative manner as described in PAS1192-2: 2013 & PAS1192.3: 2014 and provided in conjunction with BS1192:2007
3.03	Roles and responsibilities of the supply chain members and clients of BIM Level 2 and the implications on Scopes of Services
3.04	BIM Plain Language Questions, Employers Information Requirements (EIR), Organisation Information Requirements, Asset Information Requirements and the exchange of information between supply chain and client in a collaborative manner in context of PAS1192.2: 2013 and PAS1192.3:2014
3.05	BIM Execution Plan (BEP) in context of PAS1192.2:2013 - the related concepts, purpose and implementation principles
3.06	Digital delivery of information between supply chain members and with clients in context of BS1192-4:2014(COBie), Digital Plan or Work (DPoW) and classification systems
3.07	The Concept, purpose and implementation principles of Project Information Models (PIM) & Asset Information Models (AIM) and the relationship and interchange between them
3.08	A Common Data Environment (CDE) as described in the 1192 suite of standards
3.09	The implications of Level 2 BIM in relation to project team working methods as described in BS1192 :2007
3.10	The way in which Level 2 BIM can be adopted to benefit decision-making for design management
3.11	Technologies and methods for creating, using and maintaining structured information
3.12	Contractual interventions required to support BIM Level 2 and the implications on exiting forms of contract
3.13	Ownership of information and related issues of IP and copyright, insurances and potential liabilities
3.14	Requirements for security-minded policies, processes and procedures which address specific security threats or combinations of threats in a consistent and holistic manner

	Highly recommended	Recommended	Encouraged
Promote industry pilot projects	Organisations and companies should encourage adoption of the BIM methodology as a global cross-departmental strategy, establishing policies that set goals and plans for providing required training. Organisations should also encourage staff to share best practices and lessons learnt from their practical experience, to allow continuous improvement on the BIM methodologies and to correct deviations.	Start building practical experience and capability across the entire construction value chain.	Could highlight industry successes to encourage others to invest in capability development. Keep number of pilot projects in balance with client and market capacity.

	Recommended
Increasing use of strategic lever to grow capacity	The public sector programme should provide consistent and long term encouragement or requirements to progressively grow industry wide capacity for digital methods. It is recommended, that public procurement be used to progressively introduce BIM to public project tenders and contracts.

	Recommended	Encouraged
Measure and monitor progress against goals, embed change	It is recommended to assess work practices and digital maturity levels from the beginning. This provides a basis for targets and common ways of working across industry. On a European (and international) level it is recommended to establish and participate in a common set of metrics (KPIs) to measure and monitor the uptake and effects of BIM in practice. Should produce surveys and lessons learned reports which identifies areas for improvement and thereby creates focus for skills and capacity development of the industry.	Could produce measurements and reports of pilot projects and industry adoption levels to encourage the long term industry wide transition to digital methods.

Implementation level recommendations

What is the action?
Why is the action important?
What is the implementation recommendation?
How has the recommended action been implemented?

The principle audience for this implementation level definition includes:

- Public procurers and technical managers within public client organisations
- Technical policy officers, public sector legal specialists
- Building and infrastructure regulatory officers
- Industry suppliers (e.g. manufacturers, architects, engineers, contractors and asset operators)

Policy

	Highly Recommended	Recommended
Contractual arrangements	Obligations, liabilities and associated limitations for BIM are incorporated into the contract, for example as a BIM specific appendix or protocol.	Provide templates for BIM specific arrangements for different procurement strategies.

What is the action?

The primary objective of the contractual arrangements is to enable the production of Building Information Models at defined stages of a project.

The contractual arrangements for the use of BIM models and derived data are agreed between the contracting parties in a protocol, contract appendix or separate contract.

The contractual arrangements cover specific obligations, liabilities and associated limitations, for example permitted purposes for the use of models, treatment of Intellectual Property, liability for use of models and data, electronic data exchange and change management.

EXCHANGE INFORMATION REQUIREMENTS (EIR)

The content of the EIR basically covers three areas:

Technical: Details of software platforms, definitions of levels of detail etc

Management: Details of management processes to be adopted in connection with BIM on a project

Commercial: Details of BIM Model deliverables, timing of data exchange and definitions of information purposes

	Highly Recommended	Recommended
Exchange Information Requirements	Data and information required by the appointing party should be specified as part of the tender documents. Over-specification should be avoided and a best practice methodology should be adopted. Building Owners and Operators shall spell out clearly, their own operational needs and requirements for the project itself and for the BIM project strategy at the appropriate point in time.	Provide templates and tools for EIR documents for different types of projects.

EXCHANGE INFORMATION REQUIREMENTS (EIR)

EIRs are an important element of project BIM implementation as they are used to set out clearly to the bidder what models and data are required and what the purposes of the data will be.

Their intention is to limit the production and provision of information to what is really required at a certain point in time and make the production of information a truly lean process.

The EIR allow the contracting parties to plan for the delivery of the required information. Where a supply chain exists the information requirements should descend the supply chain to the level at which the information can be most easily provided.

BIM CAPABILITY CRITERIA

	Highly Recommended	Recommended	
BIM capability criteria	The assessment of contracted party capability and capacity should include assessment of the highly-recommended activities provided in this document and the bidders commitment to comply with the relevant standards, this guide and the contracting party's information requirements.	Whilst practical BIM experience is still limited in some regions and markets, the assessment criteria should not exclude a large proportion of suppliers, otherwise there might not be sufficient capacity in the market.	Apply BIM capability criteria that can be assessed objectively. Each question can have two parts – first a yes / no response, for example does the supply chain do something / have capacity. Second half is details of what the supply can do / how they do it.

DELIVERY PLAN

Why is it important?

Planning for information delivery is where the collaboration in the BIM methodology starts.

Expanding the BIM Execution Plan to include the delivery of its own information is the responsibility of the contracted party, but it can't be done without involvement of the project client or the supply chain.

All parties involved at that point in time need to agree on a single delivery plan for the project, so everyone knows what the responsibilities are and that the solutions outlined in the plan meet the different requirements and constraints.

	Highly Recommended	Recommended	
BIM capability criteria	Develop a BEP template that aligns with the EIR template, as it is a very quick way to compare suppliers and identify gaps	Details about management and delivery of data, i.e. formats, level of detail, modelling conventions, processes, etc. are incorporated into the project plan or project handbook.	Clients should take an active role in the process to ensure that their information requirements will be met.

VENDOR-NEUTRAL DATA EXCHANGE

Data can be exchanged in platform neutral, open file formats that are not controlled by a single vendor or group of vendors.

One commonly used collaboration format in Building information modeling (BIM) is IFC (Industry Foundation Class).

The IFC model specification is open and available. It is registered by ISO and is an official International Standard.

	Highly Recommended	Recommended	Encouraged
Vendor-neutral data exchange	Require non-proprietary data exchange formats at specified milestones in order to facilitate the exchange of data between the employer and the supplier		In order to avoid data loss encourage the additional supply of native file formats

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Netherlands, Rijkswaterstaat

Framework / Performance Criteria: Performance Criteria
Topic: Vendor-neutral data exchange
Recommendation: Require non-proprietary data exchange formats in contracts

CONTEXT

Rijkswaterstaat requires in their contracts to exchange information in accordance with the Dutch open standards. One standard describes the process of exchanging information. Another standard describes what kind of information in which data structure need to be exchanged. This works very well in combination with an object type library.

WHY WAS IT DONE AS DESCRIBED?

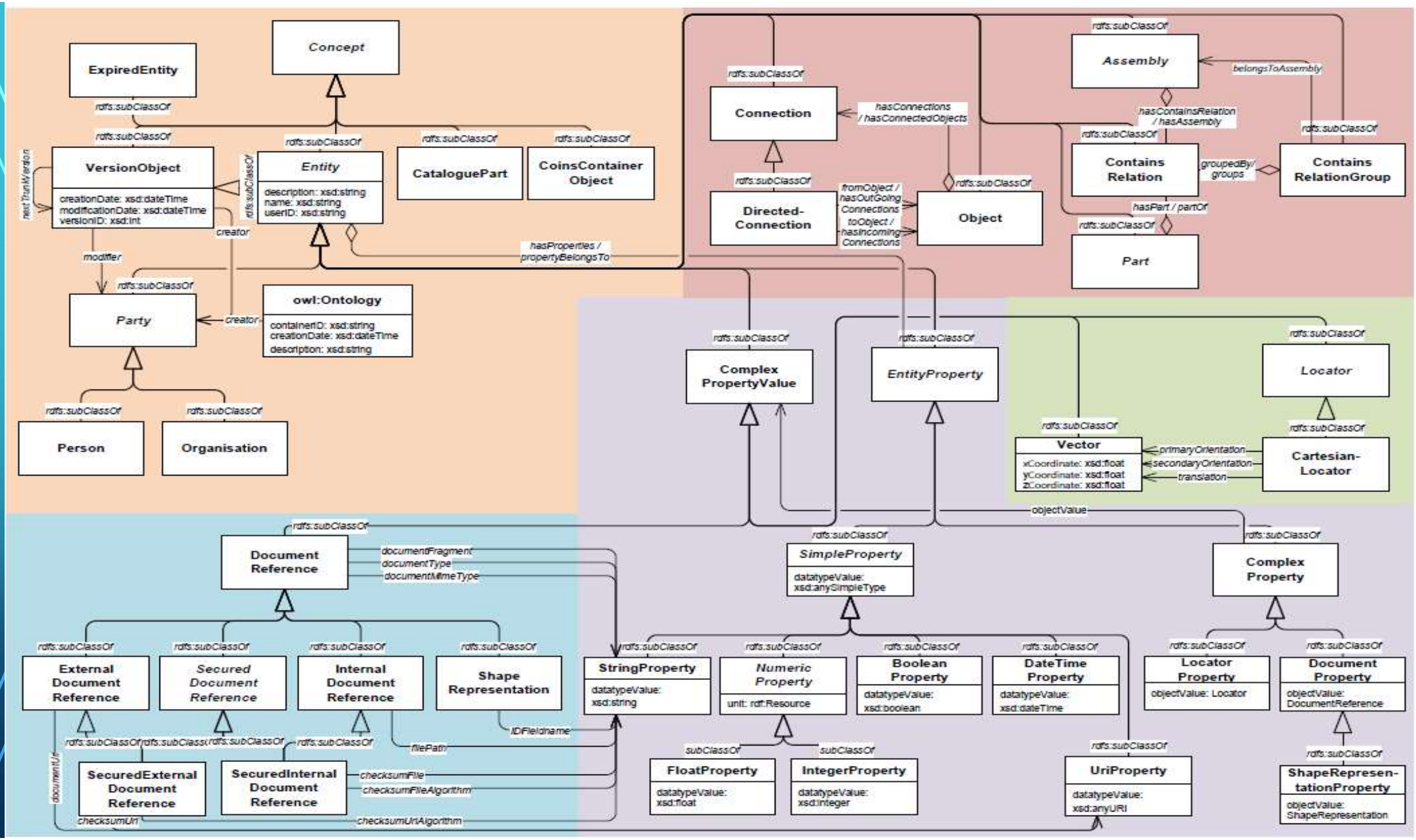
The open standard approach makes the data delivery and data exchange more efficient which result in better quality and a reduction in costs. This also provides a level playing field for all parties without excluding one, especially important for attracting SMEs. This is achieved via the use of open standards. In this way a vendor locked in situation can be avoided.

FURTHER INFORMATION

- http://www.coinsweb.nl/index_uk.html
- http://www.crow.nl/getmedia/991abf25-8088-4703-8445-de47788eb206/Flyer-What-is-VISI,-100617-rev0.aspx

COINS

COINS Navigator 2


Concept
ExpiredEntity
rdfs:subClassOf
VersionObject
creationDate: xsd:dateTime
modificationDate: xsd:dateTime
versionID: xsd:int
nextTrunkVersion
Entity
description: xsd:string
name: xsd:string
userID: xsd:string
CataloguePart
CoinsContainer Object
creator
modifier
Party
owl:Ontology
containerID: xsd:string
creationDate: xsd:dateTime
description: xsd:string
Person
Organisation
hasProperties / propertyBelongsTo
Connection
hasConnections / hasConnectedObjects
Directed-Connection
fromObject / hasOutGoing Connections
toObject / hasIncoming Connections
Object
Assembly
belongsToAssembly
hasContainsRelation / hasAssembly
Contains Relation
groupedBy / groups
Contains RelationGroup
hasPart / partOf
Part
Complex PropertyValue
EntityProperty
Locator
Vector
xCoordinate: xsd:float
yCoordinate: xsd:float
zCoordinate: xsd:float
primaryOrientation
secondaryOrientation
translation
Cartesian-Locator
objectValue
Document Reference
documentFragment
documentType
documentMimeType
External Document Reference
Secured Document Reference
Internal Document Reference
Shape Representation
IDFieldname
filePath
documentURI
SecuredExternal Document Reference
SecuredInternal Document Reference
checksumFile
checksumFileAlgorithm
checksumUri
checksumUriAlgorithm
SimpleProperty
datatypeValue: xsd:anySimpleType
StringProperty
datatypeValue: xsd:string
Numeric Property
unit: rdf:Resource
Boolean Property
datatypeValue: xsd:boolean
DateTime Property
datatypeValue: xsd:dateTime
FloatProperty
datatypeValue: xsd:float
IntegerProperty
datatypeValue: xsd:integer
UriProperty
datatypeValue: xsd:anyURI
Complex Property
Locator Property
objectValue: Locator
Document Property
objectValue: DocumentReference
ShapeRepresen-tationProperty
objectValue: ShapeRepresentation
subClassOf

OBJECT-ORIENTATED ORGANISATION OF INFORMATION

The “object-oriented” approach describes the characteristics or properties of things.

In the object-oriented approach, the object is central, thus acting as a container of characteristics or properties.

Properties have values, optionally expressed in units. The set of properties associated with an object provide the formal definition of the object as well as its typical behaviour.

The role that an object is intended to play can be designated through a model.
Objects may be related to formal classification systems through the provision of references

	Highly Recommended	Recommended
Object-orientated organisation of information	Apply an object-orientated approach where a set of properties is associated with an object to provide the formal definition of the object as well as its typical behaviour.	Classification systems, information models, object models and process models should be referenced from within a common framework of international standards.

Rijkswaterstaat, OTL

Framework / Performance Criteria: Performance Criteria
Topic: Object-oriented organisation of information
Recommendation: Apply an object-oriented approach where a set of properties is associated with an object to provide the formal definition of the object as well as its typical behaviour

CONTEXT

Rijkswaterstaat (RWS), the Dutch national road and waterways authority, has designed its own object type library (OTL) and requires all data to be delivered in accordance to that OTL. In more than 20 contracts of Rijkswaterstaat's infrastructure (roads, waterways, locks) RWS requires contractors to deliver data according to the structure of the RWS OTL. The OTL is a taxonomy with objects which are related to each other. Each object contains a set of properties which may contain data of real physical objects (to be build or maintained).

WHY WAS IT DONE AS DESCRIBED?

RWS' asset management system is a historically grown collection of other systems, which overlap or do not relate to each other in certain areas. Hence it was impossible to require suppliers to deliver data according to one specific structure – it didn't exist! This was the reason to develop an object type library, which ensures that the relevant information is delivered in the required format and referring to the right objects. Furthermore the object data and structure can be used as backbone for the future modernisation of the asset management system.

WHAT LESSONS CAN BE LEARNED?

Providing one specific data structure to all stakeholders (designers, contractors and asset managers) helps to improve the data hand-over from the supply chain to the employer and from the employer to the asset manager and vice versa. It is not just a different technical solution, it has a significant impact on how people work and generate and deliver data, resulting in a better quality of data and better cost control.

FURTHER INFORMATION

- https://otl.rws.nl/publicatieomgeving/#/

CONTAINER-BASED COLLABORATIVE WORKING

Container-based collaborative working basically means two things:

The principle that the author or originator of a piece of information, for example a model or a drawing, is responsible and liable for the content and quality still applies,

Certain rules concerning the processes of information management are defined so that data and information can be exchanged in a secure and efficient way.

	Highly Recommended	Recommended	Encouraged
Container-based collaborative working	Apply the fundamental principles of container-based collaborative working where originators produce working which the control, sourcing verified information from others where required by way of reference, federation or direct information exchange.	Should use appropriate tool support to enable a container-based collaborative working. Tools should support distributed work, version- and configuration management, access control and workflows.	Could make use of standardized methods like BCF (BIM Collaboration Format) to enable a formalized way of messaging between parties within the project workflow.

COMMON DATA ENVIRONMENT

A Common Data Environment (CDE) is a system for managing data and information. The CDE is not just a web- or cloud-based “data room”.
It comprises the required processes and rules to make sure that people are working on or using the current version of a file or a model and telling them what they can use it for.

The CDE principles are well defined and described. They have been derived from mature project management methodologies and amended to meet the specific needs of construction projects.
Many electronic data management systems have the standard workflow implemented, which enables an efficient set-up and administration of the process.

	Highly Recommended	Recommended	Encouraged
Common Data Environment (CDE)	Apply the CDE principle as a means of allowing quality assured information to be managed and shared efficiently and accurately between all members of the project team – whether that information is geo-spatial, design, textual or numeric.		Security should be considered as part of the management process. Encourage the use of a managed environment to store shared asset data and information, with appropriate and secure availability to all individuals who are required to produce, use and maintain it.

ASSIGN RESPONSIBILITY FOR DATA AND INFORMATION MANAGEMENT

The importance and complexity of project and asset information management activities and responsibilities are often underestimated.

Every single person working on a construction project requires and generates an enormous amount of data and information. This is not limited to models and drawings.

It includes all types of project data, for example schedules, emails, photographs, specifications, etc. Choosing and implementing the most efficient and appropriate technical solution that best supports the processes, security and other requirements as well as the needs of the people with the data, is not a trivial task.

	Highly Recommended	Recommended	Encouraged
Assign responsibility for data and information management	Responsibilities for data and information management should be assigned to competent and qualified individuals Information management roles should not refer to design responsibilities.	Resourcing of data and information management responsibilities should be proportionate to the size and complexity of the project	Task-based role definition: identifying the information needs, related tasks and required workflows form the basis to fill the roles needed for any contract appropriately

By 2025, “full-scale digitalization...will lead to annual global cost savings of 13% to 21% in the design, engineering and construction phases and 10%to 17% in the operations phase”

BCG (The Boston Consulting Group)‘Digital in Engineering and Construction: The Transformative Power of Building Information Modeling’ 2016